NK Routing Systems

NK-3G144 User Guide

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1. Provide a Superior Customer Experience
    - offer the best product quality and support
2. Make Cool Practical Technology
    - develop great products that customers love

Ross has become well known for the Ross Video Code of Ethics. It guides our interactions and empowers our employees. I hope you enjoy reading it below.

If anything at all with your Ross experience does not live up to your expectations be sure to reach out to us at *solutions@rossvideo.com*.

David Ross
CEO, Ross Video
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Ross Video Code of Ethics

Any company is the sum total of the people that make things happen. At Ross, our employees are a special group. Our employees truly care about doing a great job and delivering a high quality customer experience every day. This code of ethics hangs on the wall of all Ross Video locations to guide our behavior:

1. We will always act in our customers' best interest.
2. We will do our best to understand our customers' requirements.
3. We will not ship crap.
4. We will be great to work with.
5. We will do something extra for our customers, as an apology, when something big goes wrong and it's our fault.
6. We will keep our promises.
7. We will treat the competition with respect.
8. We will cooperate with and help other friendly companies.
9. We will go above and beyond in times of crisis. *If there's no one to authorize the required action in times of company or customer crisis - do what you know in your heart is right. (You may rent helicopters if necessary.)*

NK-3G144 · User Guide

- Ross Part Number: **9807DR-5600-04**
- Release Date: December 6, 2017.
- Equipment: This document applies to the NK-3G144-X (2500AR-202-*XX*) frame.

The information contained in this Guide is subject to change without notice or obligation.

Copyright

Patents

This product is protected by the following US Patents: 4,205,346; 5,115,314; 5,280,346; 5,561,404; 7,034,886; 7,508,455; 7,602,446; 7,834,886; 7,914,332. This product is protected by the following Canadian Patents: 2039277; 1237518; 1127289. Other patents pending.

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Safety Notices

Refer to the "**Important Regulatory and Safety Notices**" document that accompanied your product.

Statement of Compliance

This product has been determined to be compliant with the applicable standards, regulations, and directives for the countries where the product is marketed.

Compliance documentation, such as certification or Declaration of Compliance for the product is available upon request by contacting techsupport@rossvideo.com. Please include the product; model number identifiers and serial number and country that compliance information is needed in request.

EMC Notices

US FCC Part 15

This equipment has been tested and found to comply with the limits for a class A Digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a Commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful

interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

> **Notice** — *Changes or modifications to this equipment not expressly approved by Ross Video Limited could void the user's authority to operate this equipment.*

Canada

This Class A device complies with Canadian ICES-003 rules.

Cet appariel numerique de la classe "A" est conforme a la norme NMB-003 du Canada.

European Union

This equipment is in compliance with the essential requirements and other relevant provisions established under regulation (EC) No 765/2008 and Decision No 768/2008/EC referred to as the "New Legislative Framework".

> ⚠️ **Warning** — *This equipment is compliant with Class A of CISPR 32. In a residential environment this equipment may cause radio interference.*

Australia/New Zealand

This equipment is in compliance with the provisions established under the Radiocommunications Act 1992 and Radiocommunications Labeling (Electromagnetic Compatibility) Notice 2008.

Korea

This equipment is in compliance with the provisions established under the Radio Waves Act.

Class A equipment (Broadcasting and communications service for business use).

This device is a business-use (Class A) EMC-compliant device. The seller and user are advised to be aware of this fact. This device is intended for use in areas outside home.

Type of Equipment	User's Guide
A급 기기 (업무용 방송통신기자재)	이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.
Class A Equipment (Industrial Broadcasting & Communication Equipment)	This equipment is **Industrial (Class A) electromagnetic wave suitability equipment** and seller or user should take notice of it, and this equipment is to be used in the places except for home.

International

This equipment has been tested under the requirements of CISPR 22:2008 or CISPR 32:2015 and found to comply with the limits for a Class A Digital device.

> **Notice** — *This is a Class A product. In domestic environments, this product may cause radio interference, in which case the user may have to take adequate measures.*

Warranty and Repair Policy

The OverDrive Live and OverDrive News systems are backed by a comprehensive one-year warranty on all components.

If an item becomes defective within the warranty period Ross will repair or replace the defective item, as determined solely by Ross.

Warranty repairs will be conducted at Ross, with all shipping FOB Ross dock. If repairs are conducted at the customer site, reasonable out-of-pocket charges will apply. At the discretion of Ross, and on a temporary loan basis, plug in circuit boards or other replacement parts may be supplied free of charge while defective items undergo repair. Return packing, shipping, and special handling costs are the responsibility of the customer.

This warranty is void if products are subjected to misuse, neglect, accident, improper installation or application, or unauthorized modification.

In no event shall Ross Video Limited be liable for direct, indirect, special, incidental, or consequential damages (including loss of profit). Implied warranties, including that of merchantability and fitness for a particular purpose, are expressly limited to the duration of this warranty.

This warranty is TRANSFERABLE to subsequent owners, subject to Ross' notification of change of ownership.

Extended Warranty

For customers that require a longer warranty period, Ross offers an extended warranty plan to extend the standard warranty period by one year increments. For more information about an extended warranty for your OverDrive system, contact your regional sales manager.

Environmental Information

The equipment may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Ross Video encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed-out wheeled bin symbol invites you to use these systems.

If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration. You can also contact Ross Video for more information on the environmental performances of our products.

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Introduction

Thank you for purchasing the Ross Video NK-3G144 3G/HD/SDI Multi-Definition SDI Router. With Ross Video's reputation for delivering leading-edge routing switcher equipment and our unsurpassed level of customer service and support, you can look forward to many years of reliable broadcasting. Please read this guide thoroughly and retain it for future reference.

This guide is for system administrators, installers, and operators of the Ross Video NK-3G144 Routing Switcher. It provides instructions on how to connect the routing switcher system, and how to set up a configuration file for the routing switcher using DashBoard. It assumes that you are experienced with general broadcast concepts, and that you are familiar with the planning requirements for a routing switcher system.

- "**Introduction**" summarizes the guide and provides important terms, and conventions.
- "**Hardware Overview**" provides
- "**Installation**" provides
- "**Setting up a Routing Switcher**" provides
- "**Operating a Routing Switcher**" provides
- "**Maintenance**" provides
- "**NK-3G144 Inputs and Outputs**" provides
- "**Connectors**" provides
- "**Technical Specifications**" provides the specifications for the RCP Series products.

Related Publications

It is recommended to consult the following Ross documentation before installing and configuring your RCP Series:

- *DashBoard User Guide*, Ross Part Number: 8351DR-004
- *NK-NET User Guide*, Ross Part Number: 2201DR-002
- *NK-IPS User Guide*, Ross Part Number: 9807DR-1020

Documentation Conventions

Special text formats are used in this guide to identify parts of the user interface, text that a user must enter, or a sequence of menus and sub-menus that must be followed to reach a particular command.

Interface Elements

Bold text is used to identify a user interface element such as a dialog box, menu item, or button. For example:

In the **Edit** dialog, click **Insert Above**.

User Entered Text

Courier text is used to identify text that a user must enter. For example:

In the **Language** box, enter **English**.

Referenced Guides

Italic text is used to identify the titles of referenced guides, manuals, or documents. For example:

For more information, refer to the ***DashBoard User Guide***.

Menu Sequences

Menu arrows are used in procedures to identify a sequence of menu items that you must follow. For example, if a step reads "**File** > **Save As**," you would click the **File** menu and then click **Save As**.

Important Instructions

Star icons are used to identify important instructions or features. For example:

★ Contact your IT department before connecting to your facility network to ensure that there are no conflicts. They will provide you with an appropriate value for the IP Address, Subnet Mask, and Gateway for your device.

Contacting Technical Support

At Ross Video, we take pride in the quality of our products, but if problems occur, help is as close as the nearest telephone.

Our 24-hour Hot Line service ensures you have access to technical expertise around the clock. After-sales service and technical support is provided directly by Ross Video personnel. During business hours (Eastern Time), technical support personnel are available by telephone. After hours and on weekends, a direct emergency technical support phone line is available. If the technical support person who is on call does not answer this line immediately, a voice message can be left and the call will be returned shortly. This team of highly trained staff is available to react to any problem and to do whatever is necessary to ensure customer satisfaction.

• **Technical Support**: (+1) 613-652-4886
• **After Hours Emergency**: (+1) 613-349-0006
• **E-mail**: techsupport@rossvideo.com
• **Website**: http://www.rossvideo.com

Before You Begin

The NK-3G144 Routing Switcher handles high-bandwidth, broadcast-quality, digital video and audio signals, and embedded audio signals. Digital video signals can be 3G, high definition, standard definition, DVB-ASI, or SDTI. The NK-3G144 supports SMPTE standards 424M, 344M, 259M, and 292M and AES.

Features

The NK-3G144 Routing Switcher provides the following features:

• economical and professional-quality design
• a powerful control system
• support for 3G and multi-definition digital video and AES digital audio
• 10 RU design with slots for duplicate output cards
• control, switching matrix, and power redundancy options
• hot swapping of all boards and power supplies
• smart fan control and monitoring
• enhanced LED indications via the Heartbeat, cards, and power supply
• extensive monitoring via DashBoard
• firmware is fully upgradeable using DashBoard
• fully upgradeable for Carbonite eXtreme (if you have the 2500AR-202-*XX* frame)

Typical System Equipment

Routing switchers may be connected to other NK Series devices via the T-Bus control system to form a multi-level routing switcher system. For smaller routing applications, routing switchers may be used individually to provide switching across a single router level or signal type. The NK Series of routing switchers may be controlled by:

• an NK Series remote control panel
• the DashBoard NK Switchboard
• an automation system or RS232 terminal, via an NK-SCP/A ASCII/RS232 Control Interface
• the NK-VCP Virtual Control Panel
• the NK-GPI General Purpose Interface

DashBoard software may be used to set up each routing switcher via an NK-IPS Network Bridge. These parameters can be saved in a configuration file and sent to a routing switcher at any time using DashBoard.

Typical equipment that is used in an NK Series routing switcher system includes:

• any of the NK Series routing switchers with its appropriate power supply
• an NK-IPS Network Bridge
• an RCP-NK1, RCP-NKM, or RCP-NKQ Remote Control Panel
• a PC running DashBoard, connected via a CAT5 Ethernet cable to the NK-IPS
• standard source and destination equipment (for example, cameras, VTRs, servers)

✴ If you are connecting the PC directly to the NK-IPS, use a crossover CAT5 Ethernet cable.

✴ If you are connecting the PC indirectly via an Ethernet switch to the NK-IPS, use a straight-through CAT5 Ethernet cable.

★ The NK-IPS and PC with DashBoard are only required for setting up the configuration file and then sending it to the device. However, you can use the NK Switchboard feature in DashBoard to control and monitor a routing switcher system.

System Overview

A routing switcher system may use distributed control across the Internet, a LAN, or a VPN. The routing switcher system shown in **Figure 2.1** has been simplified.
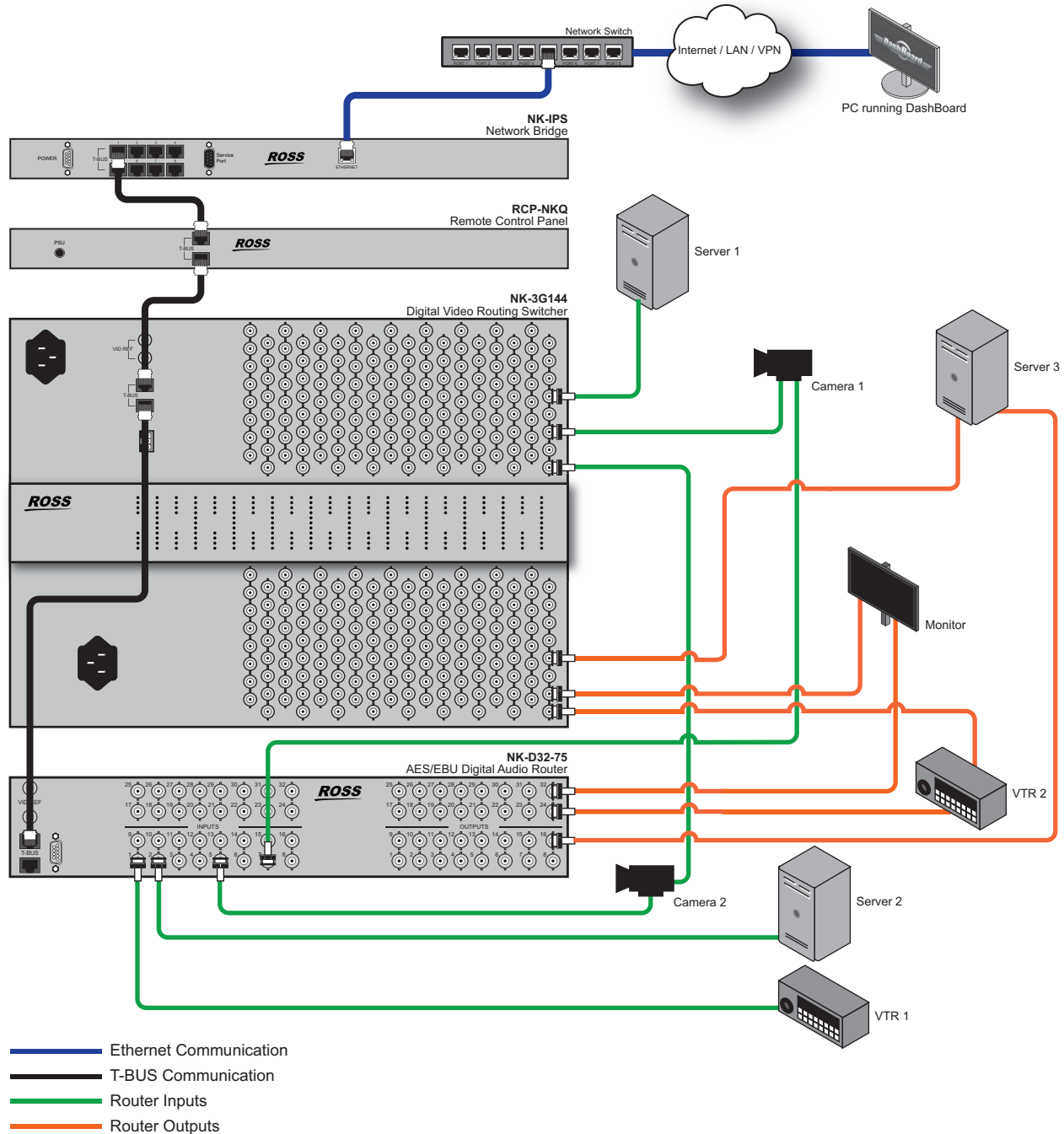
Figure 2.1 Simplified Routing Switcher System

★ All T-Bus connections between NK Series devices use straight-through CAT5 cables.

How the Panels and Routing Switchers Communicate

A routing switcher is a module that switches items of broadcast equipment from a nominated source to a nominated destination. All routing switchers in the system can be connected to other NK Series devices via the T-Bus control system, and can be connected to a video referencing signal (see "**Connecting a Video Reference to NK Series Routing Switchers**" on page 32).The NK-3G144 can be partitioned. Each partition may be assigned to a unique or common switching level.

Switching

The control panel sends a switch request message to the routing switcher. The routing switcher recognizes the request, sets the crosspoint, then sends a response to the panel.

Data Storage

The panel stores information on the menu, destination, level, breakaway, and machine control status. The routing switcher stores the crosspoint status in its internal memory.

When the system is powered up, the routing switcher restores its crosspoint status. The control panel requests the status of the routing switcher.

Hardware Overview

This chapter presents information on the NK-3G144 hardware components including the chassis, front and rear panels, and LEDs.

Front Panel

The front panel of the NK-3G144 Routing Switcher is a hinged door, held in place by a screw and two latches. It swings open to the left. The Heartbeat LED in the name badge indicates the operational and alarm status of the unit.
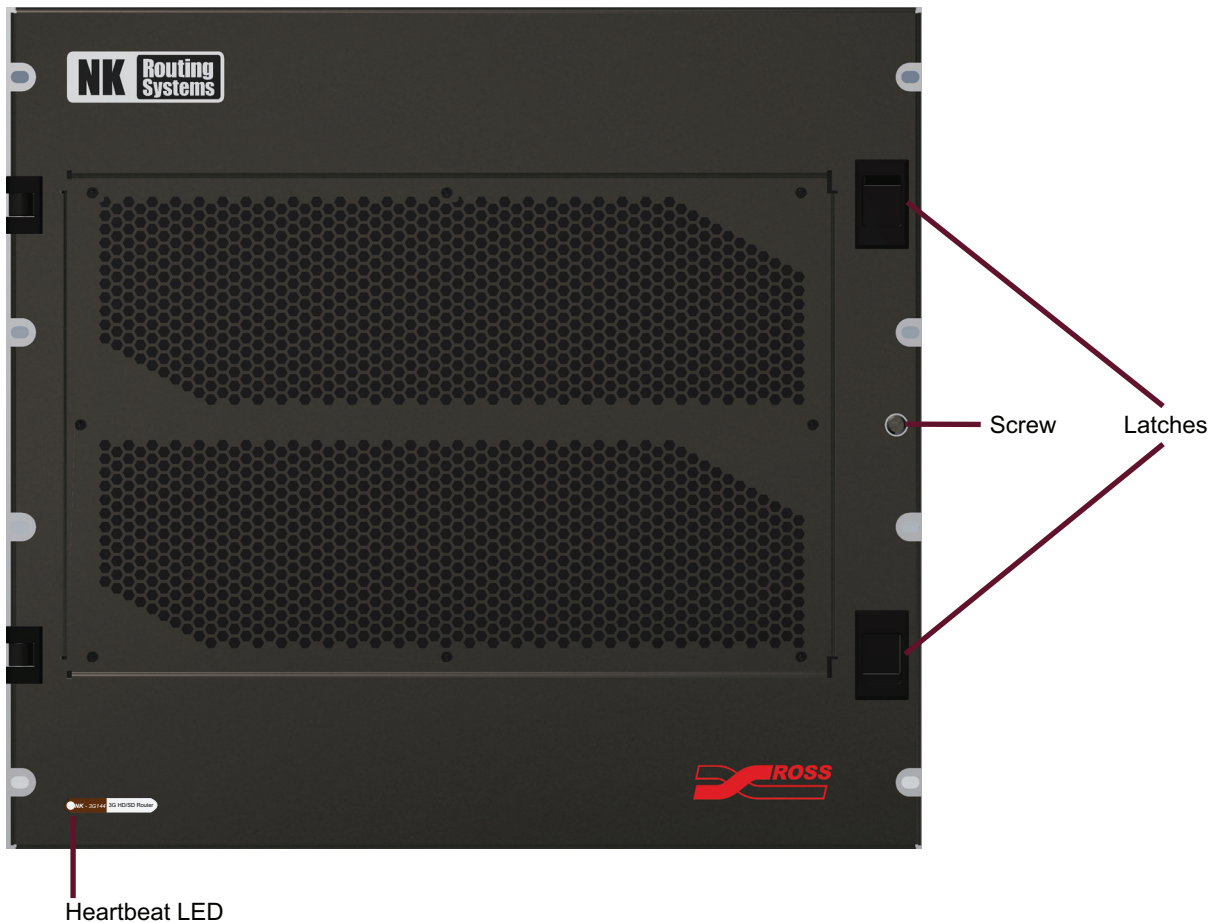
Figure 3.1 NK-3G144 — Front Panel

The front panel of the door has a ventilation grill, and behind that, reusable filters. There are two banks of three fans on the inside of the front panel (see **Figure 3.2**). The top bank of fans intakes air at the front of the unit, then blows this over the matrix core and the input cards. Similarly, the bottom bank of fans blows air onto the output cards. The speed of each fan is monitored and varied as required for the measured temperature of the cards. If the fan is not at the correct speed, or the temperature of the cards is too high, a fault is indicated.
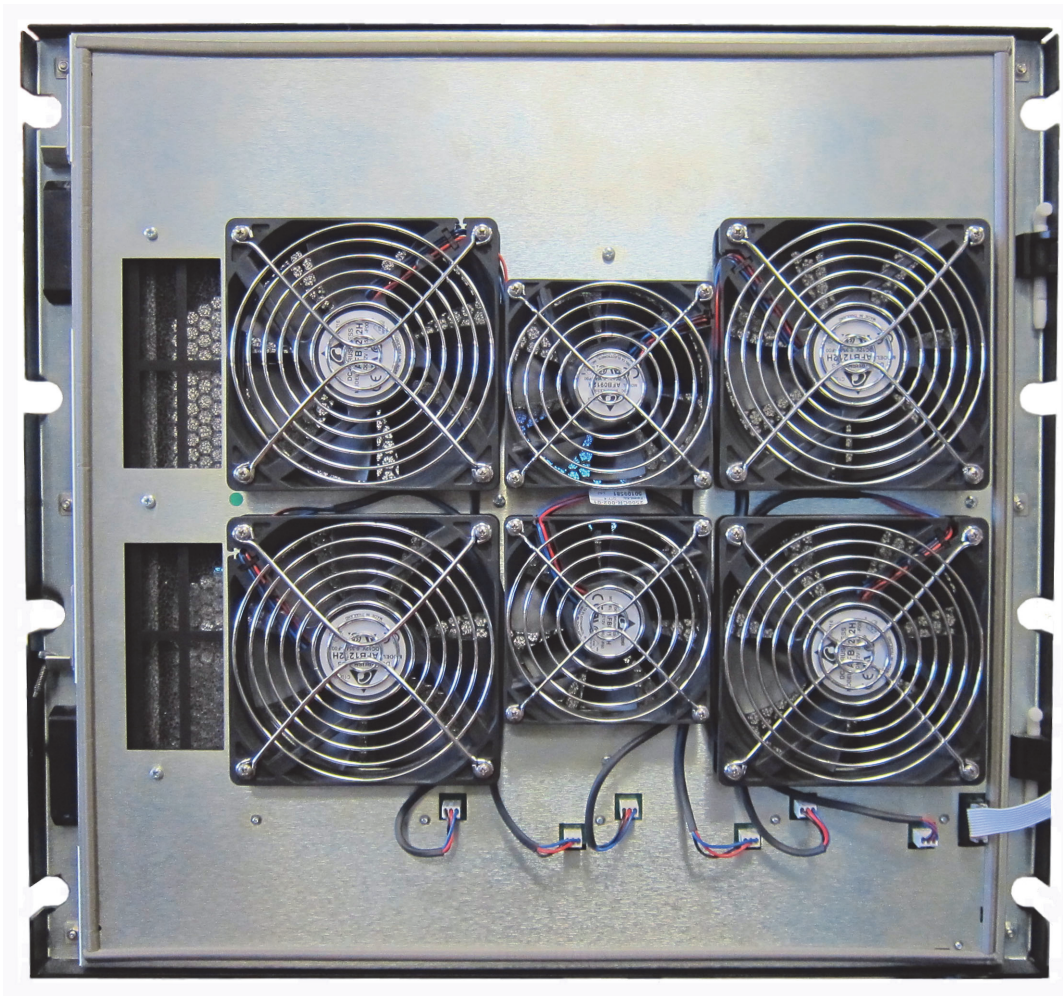
Figure 3.2 NK-3G144 — Interior of front panel

Chassis

All cards and power supplies are inserted via the front of the routing switcher. All input/output cards and control cards are inserted vertically into the frame, mating with the motherboard at the rear of the routing switcher. Matrix cards are inserted horizontally into the frame, mating with the motherboard. The motherboard sits vertically within the frame, approximately 2 cm in from the rear panel. The motherboard straddles the input, control, matrix, and output slots, providing connectivity to all boards and power supplies.
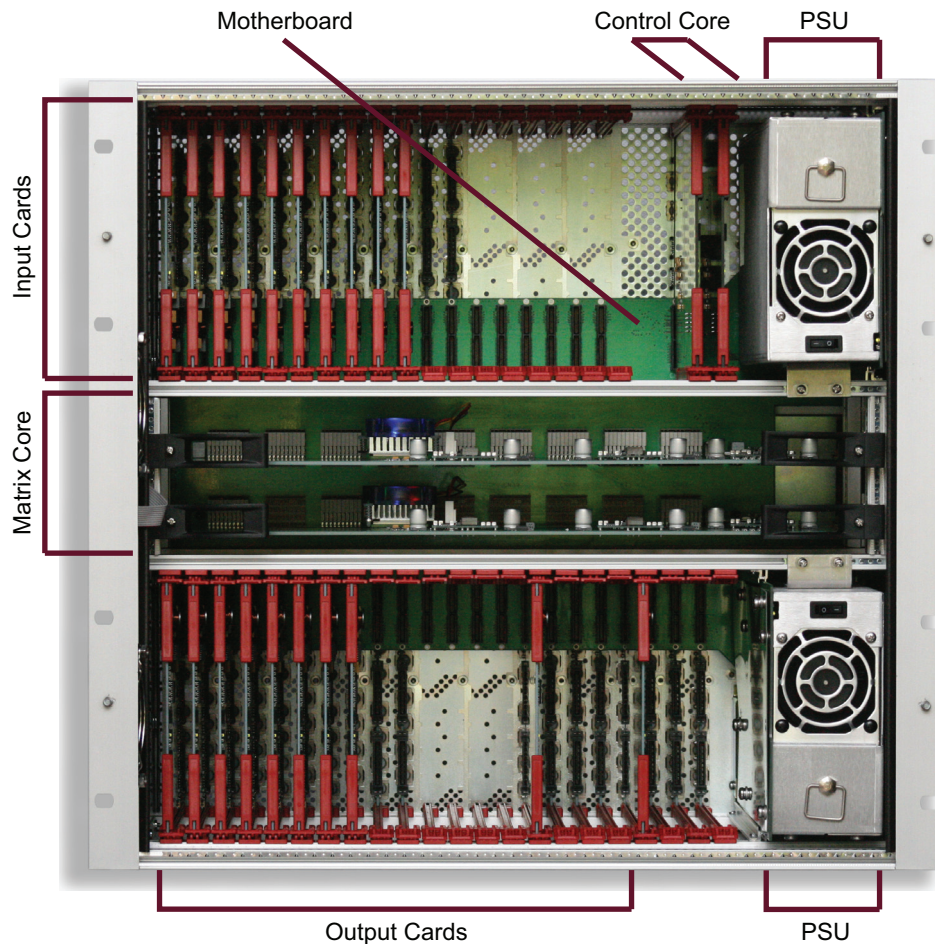
Figure 3.3 NK-3G144 — Front View of the Chassis

Cards and Accessories

The NK-3G144 Routing Switcher is expandable from one input card and one output card, up to 18 input cards and 22 output cards. Each card supports eight inputs or outputs.

Standard NK-O3G output cards may be used in slots 15D to 18D. Cards in these slots directly duplicate the outputs from slots 15 to 18 (outputs 113 to 144). The additional outputs are labelled on the rear panel as 113D to 144D. These outputs may be used as general-purpose duplicate outputs, or to monitor critical signals that are fed through outputs 113 to 144.

The control cards set the parameters for the input and output cards, and monitor their operation. The control cards are functionally responsible for the T-Bus control system, Alarm GPI, and video referencing.

The NK-3G144 has capacity for additional control and matrix cards, which provide redundancy.

Table 3.1 NK-3G144 Models and Accessories

Model number	Comment
NK-3G144(64)	3G/HD/SD digital video routing switcher, 64 inputs, 64 outputs, expandable in groups of 8 per input card (NK-I3G) and output card (NK-O3G), up to 144×144.
	4 duplicate output slots are provided for monitoring critical output signals, or as general-purpose duplicate outputs.
NK-3G144(96)	3G/HD/SD digital video routing switcher, 96 inputs, 96 outputs, expandable in groups of 8 per input card (NK-I3G) and output card (NK-O3G), up to 144×144.
	4 duplicate output slots are provided for monitoring critical output signals, or as general-purpose duplicate outputs.
NK-3G144(128)	3G/HD/SD digital video routing switcher, 128 inputs, 128 outputs, expandable in groups of 8 per input card (NK-I3G) and output card (NK-O3G), up to 144×144.
	4 duplicate output slots are provided for monitoring critical output signals, or as general-purpose duplicate outputs.
NK-3G144	3G/HD/SD digital video routing switcher, 144 inputs, 144 outputs, in groups of 8 per input card (NK-I3G) and output card (NK-O3G).
	Minimum of one NK-I3G and one NK-O3G card.
	Four duplicate output slots are provided for monitoring critical output signals, or as general-purpose duplicate outputs.
	See **Figure 3.4**.
NK-3G-FRM	Digital video routing switcher frame
NK-I3G	3G input card, 8 inputs per card
NK-O3G	3G output card, 8 outputs per card
NK-I3G-RC	3G input BNC rear connector strip
NK-O3G-RC	3G output BNC rear connector strip
NK-C3G	Control card
NK-144X3G	Matrix card
NK-P3G	Power supply unit

★ The cards may be installed in *any* of the 18 slots on the left-hand side of the frame (see **Figure 3.3**). They do not have to be installed sequentially.

For More Information on...

• installing cards see "**Inserting a Card into the NK-3G144**" on page 29.

Rear Panel

The rear panel and frame provides a support structure for mounting an input or output BNC rear connector strip. There are ventilation grills in the rear panel that allow the hot air to escape from the routing switcher.

Each input and output card in the frame must have an input or output BNC rear connector strip connected to the corresponding position in the rear panel. One of these BNC rear connector strips supports two cards.

For More Information on...

• attaching a BNC rear connector strip, refer to "**Attaching a BNC Rear Connector Strip to the Rear Panel of the NK-3G144**" on page 28.

An EMC gasket is fitted to the frame. A blanking plate or an input/output BNC rear connector strip is attached through this gasket to the frame.
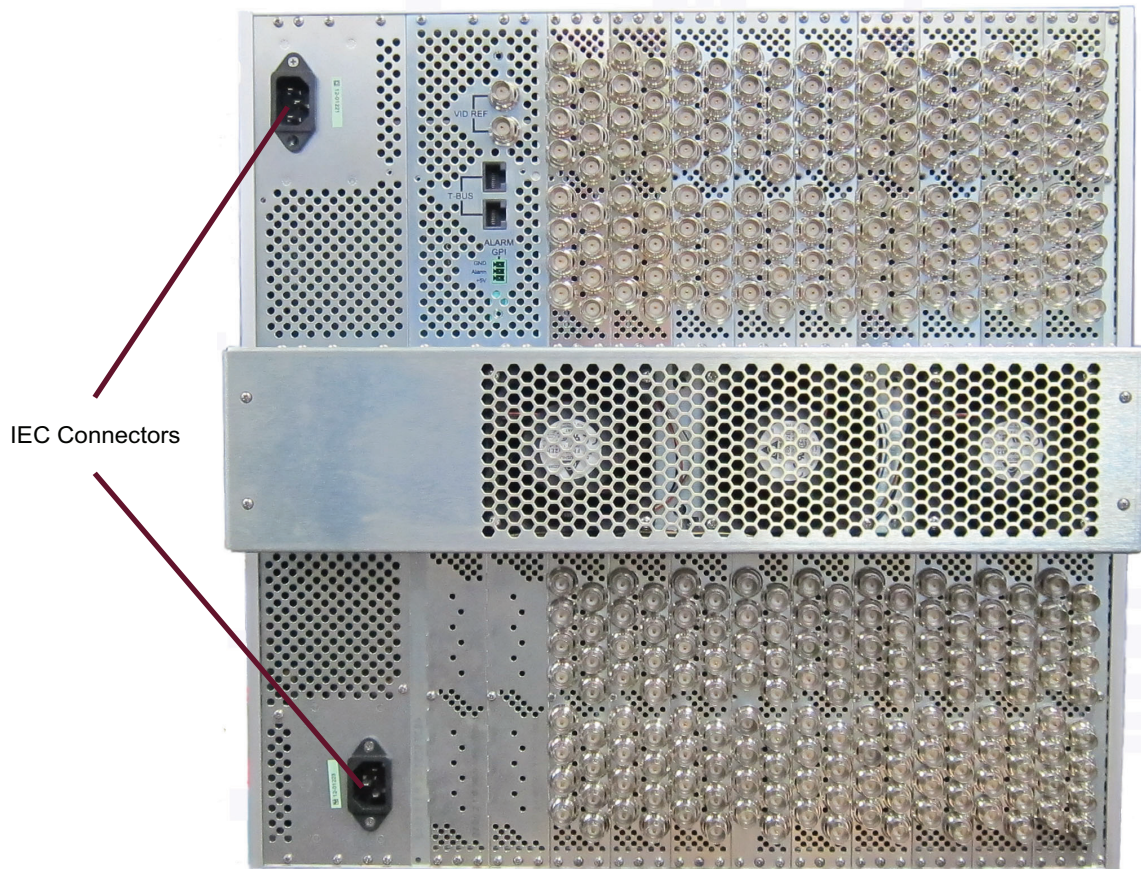
IEC Connectors

Figure 3.4 NK-3G144 — Rear Panel

★ If a BNC rear connector strip is not fitted, a rear blanking plate must be fitted in place of the connector strip to maintain EMC and cooling performance.

Figure 3.5 NK-3G144 — Rear Panel of the Control Cards

The control cards are functionally responsible for the T-Bus control system, Alarm GPI, and video referencing.

T-Bus Control System

The T-Bus control system is a multi-drop RS485-based system that supports collision detection and half duplex communications. It may also be used to provide phantom power to some devices.

Power

The NK-3G144 uses an IEC connector that provides AC mains power to the +15 V DC, 32 A PSU mounted in the frame. A second IEC connector can be used to install an optional second PSU for redundancy and load sharing.

Alarm GPI

The Alarm GPI is a normally closed relay output. The relay output is open when the frame is powered on and there are no alarms present.

Conditions that will assert the Alarm GPI output:

Table 3.2 Alarm Conditions

Component	Possible Reason
Matrix	Fan failure
	Overheating
	Power failure
Input/Output cards	Overheating
	Power failure
Remote Control Power	Fuse open
PSU	PSU failure
	PSU removed

The conditions that generate an alarm are critical incidents that stop the routing switcher from working. If the routing switcher is not supervised or at a remote site, such an alarm is used to alert system technicians that a failure has occurred, or the alarm could be used to trigger a backup system.

Video Reference

The NK-3G144 Routing Switcher is capable of video referencing. If connected, a video reference ensures that switching occurs in the default vertical interval across all router levels. The default switching pulse complies with RP168. Alternately, you can set your own custom switching point to meet the requirements of your system. For example, if the default settings for the switching pulse occur within the data elements of your signal, you need to assign your own switching point.

★ The non-locked switching pulse is free running.

Installation

This chapter summarizes the physical installation steps for the NK-3G144.

Overview

The NK-3G144 is powered by one +15 V DC, 32 A PSU, with an optional second PSU available to provide redundancy and load sharing.

The NK-3G144 is designed for installation into a standard 19" equipment rack. It has integrated rack ears, allowing it to be screwed in using standard screws and cage nuts.

The NK-3G144 is set up using the routing switcher editor in DashBoard.

For More Information on...

* other routing switchers that are available from Ross Video, see the *NK Series Routing Switchers Reference Manual*.

Before You Begin

These installation guidelines assume the following:

* The relevant NK Series equipment has been installed into a ventilated rack frame. The relative humidity in the environment of the equipment should be < 70% (non-condensing). The ambient temperature of the air entering the front panel should not exceed 30° C (86°F), and should not fall below 0°C (32°F). It is recommended to leave a 1 RU gap between each module.
* The routing switcher system has been well planned and designed. Consideration must be given to inputs and outputs across multiple router levels and typical operating scenarios for breakaways.
* the socket/outlet shall be installed near the equipment and shall be easily accessible.
* Correct IP addresses have been assigned to the equipment, where required.
* All NK Series equipment connected in the routing switcher system have firmware v2.00 or later. Firmware updates are available from the Ross Video website (www.rossvideo.com).

The NK-3G144 is designed to be operated with the front panel closed to ensure adequate cooling via the fans.

> **Warning** — *Do not operate the NK-3G144 for extended periods with the front panel open.*

The NK-3G144 provides phantom power via the **T-Bus** connector to other NK Series devices (NK-GPI, NK-SCP/A, NK-SCP/K2). The NK-3G144 does not receive power via the **T-Bus** connector.

For More Information on...

* updating the firmware in a device, see the readme file that comes with the firmware.

Unpacking the Equipment

On receiving your routing switcher, check the contents against the packing list. Make sure that all equipment itemized on the packing list is present and that there are no signs of damage before you start installing the routing switcher into your system.

If anything is missing or damaged, contact Ross Video immediately to obtain the correct warranty service procedures. This ensures prompt assistance, minimal turnaround time, and avoids any freight issues.

We recommend that the equipment is installed by qualified and experienced service personnel, to any relevant standards and approvals.

Before use, remove the transportation foam located between the front panel and the internal frame.

The PSU is packed separately, and must be fitted correctly (see "**Installing a PSU into the NK-3G144**" on page 24).

⚠️ **Warning** — *Always remove PSUs before shipping the routing switcher.*

Installing the Routing Switcher

⚠️ **Caution** — *When the frame is energized, Hazardous Energy Levels are present on the chassis midplane where I/O card resettable fuses make contact with the 15V DC supply bus. Hazardous Energy Sources can cause fire or serious burns under short circuit conditions. Access to the inside chassis areas should be restricted to service personnel only by use of the chassis door screw. The screw should be engaged to limit access to the inside chassis without a tool.*

Servicing within the chassis while energized should be limited to module card or supply installation, or defect replacement. Installation of the cards should be carried at the front of the enclosure and care should be taken to avoid any card or user contact with the resettable fuses on the chassis's midplane.

All other service or repair should be carried out off-line with the chassis in a de-energized state.

⚠️ **Warning** — *Ensure that the AC mains supply complies with the PSU specification before making the connection.*

⚠️ **Warning** — *The NK-3G144 must be connected to the mains earth via the IEC power connectors.*

⚠️ **Warning** — *An earthed neutral mains supply and residual current device is recommended for safe operation.*

The routing switcher is powered using the +15 V DC, 32 A PSU provided. This power supply plugs into the routing switcher from the front, and obtains its AC mains supply via the IEC connector on the rear panel. An optional second PSU is available for redundancy and load sharing.

✶ The plug on the power supply cord is intended to serve as the disconnect device.

✶ Any installation performed inside the chassis should be restricted to service personnel only.

Installing a PSU into the NK-3G144

⚠️ **ESD Susceptibility** — *Anti-static precautions must be taken when fitting or removing PSUs and the attached cards. Handle cards by the edges only. Wear an earthed wrist strap if possible, or place both hands on the metal rack frame before handling the cards. Use anti-static bags or trays to store and transport the cards.*

To install a PSU into the routing switcher

1. Unscrew the screw on the front door of the NK-3G144 (see **Figure 4.1**).

Figure 4.1 Front door screw of the NK-3G144

2. Open the front door.

3. Locate the spare position for the PSU (see **Figure 4.2**).
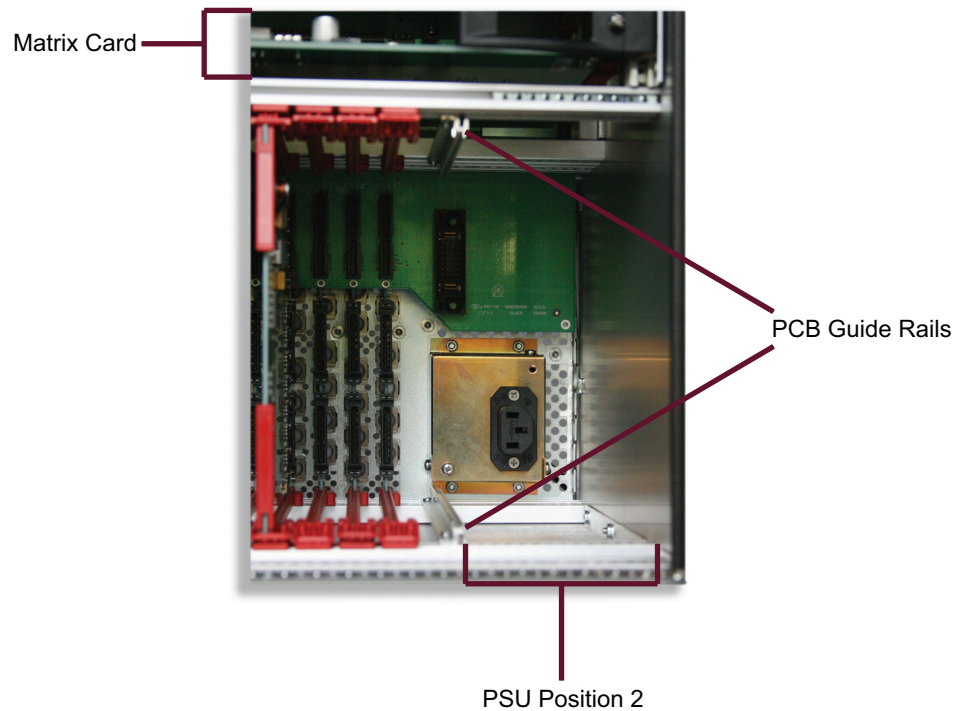

Figure 4.2 PSU position in the frame

4. Hold the PSU with the fan grill facing toward you.

5. Position the PSU so that the LED and fan are closest to the matrix card.

6. Align the PSU PCB carefully with its top and bottom guide rails, then gently push the PCB into the hole, connecting with the motherboard at the back of the frame.

7.   Screw the PSU to the frame using the two captive screws in the PSU. The two captive screws should always be fastened to prevent movement of the PSUs in the frame.

8.   Switch the PSU on by using the switch on the front of the PSU.

9.   Close the front door.

10. Insert and tighten the front door screw to secure the front door of the NK-3G144 shut.

For More Information on...

• replacing the PSU, see "**Replacing a PSU in the NK-3G144**" on page 55.

Installing the Routing Switcher System in a Daisy-Chain Layout

You may connect NK Series equipment in a daisy-chain layout. The items are connected via the T-Bus control system. However, if the T-Bus chain is broken, for example, by accidentally disconnecting a cable, downstream devices are also disconnected. T-Bus RJ-45 sockets on devices downstream from the NK-IPS are passively connected internally, so device failure or power disconnection does not disrupt communication with other devices in the chain.

Each T-Bus connector on the NK-IPS has an independent driver/receiver ensuring that each of the eight T-Bus connectors will not be affected by a device failure on any other connector.
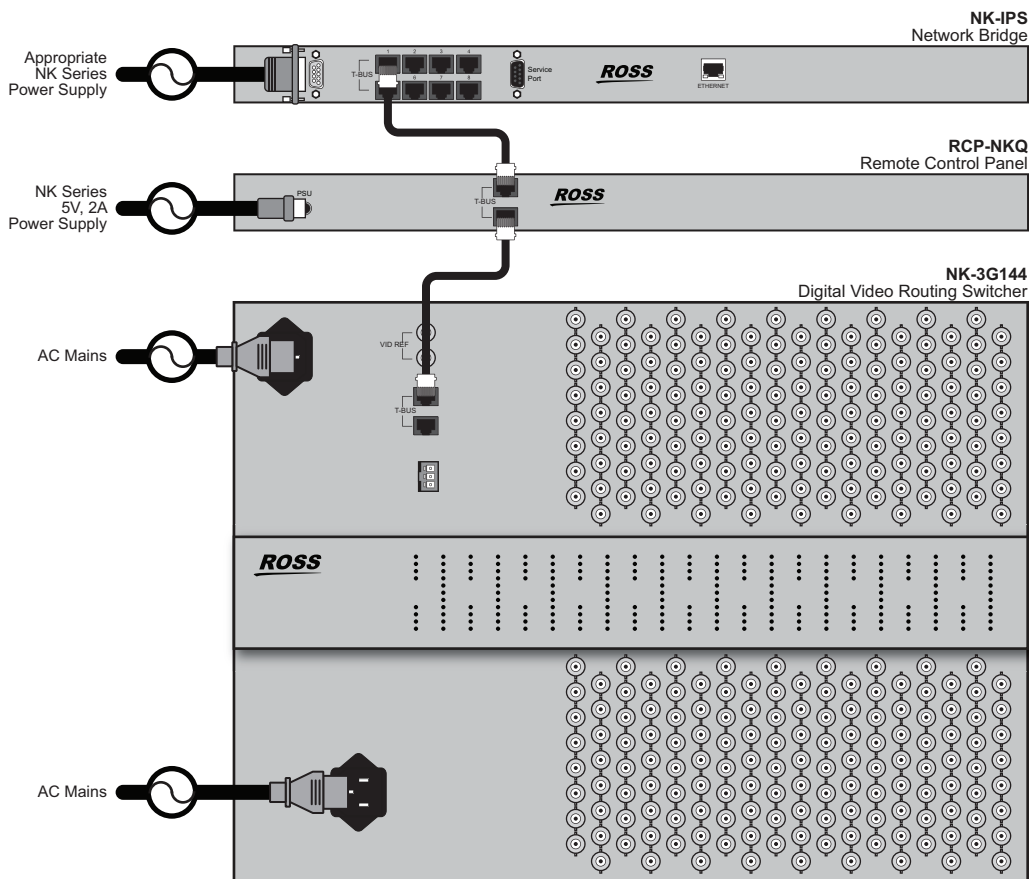

Figure 4.3 NK Series equipment in a daisy-chain layout

To connect the NK Series equipment in a daisy-chain layout

1.   Install the equipment into the rack frame, then fix in place with appropriate fasteners.

2.   Connect the NK-3G144 directly to the AC mains via the IEC connectors on the rear panel.

3. Connect a straight-through CAT5 cable between the **T-BUS** connector on the rear panel of the NK-3G144 and a **T-BUS** connector on the rear panel of a remote control panel or other control device, another NK Series routing switcher, or an NK-IPS (see **Figure 4.3**).

    If required, make a similar connection between the remaining **T-BUS** connector on the rear panel of the NK-3G144 and a **T-BUS** connector on the rear panel of another item of NK Series equipment.

4. Connect the power supply, or supplies, to the **POWER** connector on the rear panels of the NK Series equipment, if required.

5. Connect the cable from the power supply, or supplies, to a suitable AC mains supply.

★ The NK-3G144 is designed for installation into a standard 19" equipment rack. It has integrated rack ears, allowing it to be screwed in using standard screws and cage nuts.

Installing the Routing Switcher System in a Star-Layout

You may connect NK Series equipment to the NK-IPS in a star layout. The items are connected via the T-Bus control system. If any device connected directly to the NK-IPS is disconnected, it is only the downstream devices that become non-operational. All other devices remain operational.
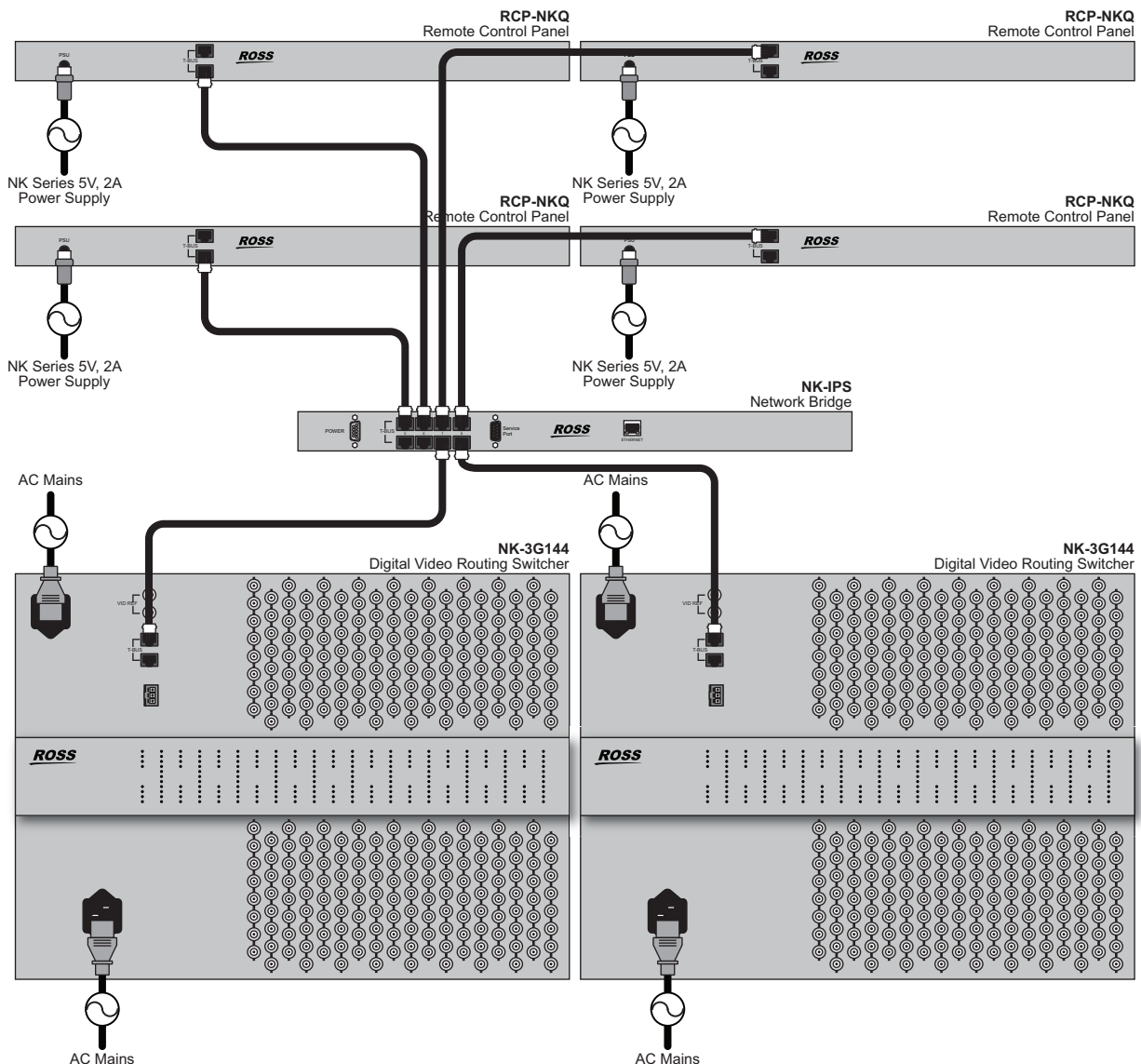

Figure 4.4 NK Series equipment in a star layout

To connect the NK Series equipment in a star layout

1. Install the routing switcher into the rack frame, then fix in place with appropriate fasteners.

2. Connect the NK-3G144 directly to the AC mains via the IEC connectors on the rear panel.

3. Connect a straight-through CAT5 cable between a **T-Bus** connector on the rear panel of the equipment and a **T-Bus** connector on the rear panel of the NK-IPS (see).

4. Connect the power supply, or supplies, to the **POWER** connector on the rear panel of the NK Series equipment, if required.

5. Connect the cable from the power supply, or supplies, to a suitable AC mains supply.

6. Connect any remaining NK Series equipment in this manner.

★ The NK-3G144 is designed for installation into a standard 19" equipment rack. It has integrated rack ears, allowing it to be screwed in using standard screws and cage nuts.

Attaching a BNC Rear Connector Strip to the Rear Panel of the NK-3G144

⚠️ **ESD Susceptibility** — *Anti-static precautions must be taken when fitting or removing rear connector strips and attached cards. Handle cards by the edges only. Wear an earthed wrist strap if possible, or place both hands on the metal rack frame before handling the cards. Use anti-static bags or trays to store and transport the cards.*

There are two types of BNC rear connector strips that you can attach to the NK-3G144:

• NK-I3G-RC (9807-5104-x 3G input)

• NK-O3G-RC (9807-5103-x 3G output)

Each BNC rear connector strip has two columns of eight connectors each; it is specific to input or output. Each BNC rear connector strip supports two corresponding cards.

To insert a BNC rear connector strip into the frame

1. Locate the part number on the BNC rear connector strip (on the outer end of the PCB).

2. On the rear panel of the routing switcher, remove the 6 screws from each blanking plate corresponding to the slots into which you want to insert cards.
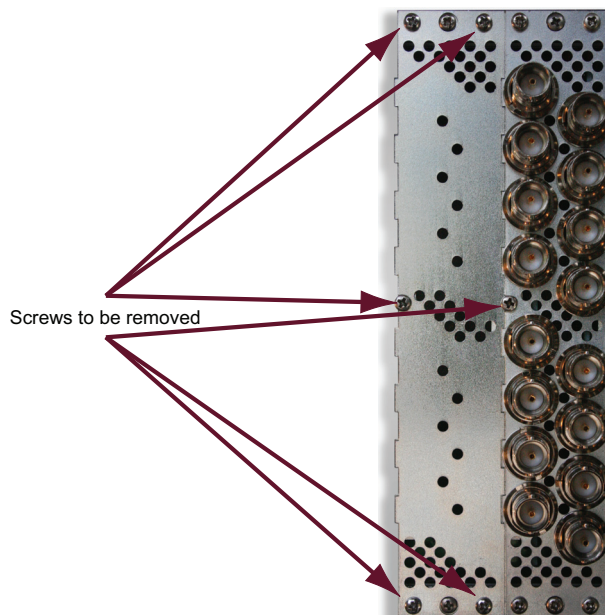

Screws to be removed

Figure 4.5 Blanking plate and BNC rear connector strip

3. Hold the BNC rear connector strip with the external BNC connectors facing away from the rear panel.

4. Position the input or output BNC rear connector strip so that the text on the PCB is up the correct way.

5. Align the BNC rear connector strip carefully with the cavity in the rear panel.

   The PCBs on the rear connector strip must line up with the guide rails in the frame that will hold the cards. These rails are on the top of the frame for input cards and the bottom of the frame for output cards.

6. Align the locating tabs along the edge of the bottom third of the PCBs with the holes in the motherboard.

7. Gently push the BNC rear connector strip into the cavity, ensuring that the locating tabs sit in the corresponding holes in the motherboard.

8. Attach the BNC rear connector strip to the rear panel using the 6 screws from the blanking plate.

9. Insert other BNC rear connector strips, as required.

Inserting a Card into the NK-3G144

ESD Susceptibility — *Anti-static precautions must be taken when fitting or removing all cards. Handle cards by the edges only. Wear an earthed wrist strap if possible, or place both hands on the metal rack frame before handling the cards. Use anti-static bags or trays to store and transport the cards.*

✸ An input/output BNC rear connector strip must be installed into the rear panel before the corresponding card can be inserted into the frame.

There are four types of cards that you can insert into the NK-3G144:

- NK-I3G (807-5004-x 3G SDI input)
- NK-O3G (9807-5003-x 3G reclocking SDI output)
- NK-144X3G (807-5006-x 144X144 3G matrix)
- NK-C3G (807-5001-x 3G control)

If upgrading to the Carbonite eXtreme, the following cards and rear module are required:

- Ethernet Interface Card (4803AR-070A)
- GPIO/Tally Card (4803AR-072A)
- Switcher/Crosspoint Card (4803AR-001A)
- GPI/Tally Rear Module (2500AR-025)

For More Information on...

- upgrading the NK-3G144 for Carbonite eXtreme, contact Ross Video.

To insert a card into the frame

1. Locate the part number on the card (next to the manufacturer logo).

2. Unscrew the screw on the front door of the NK-3G144.

Figure 4.6 NK-3G144 — Front Door Screw Location

3. Open the front door.

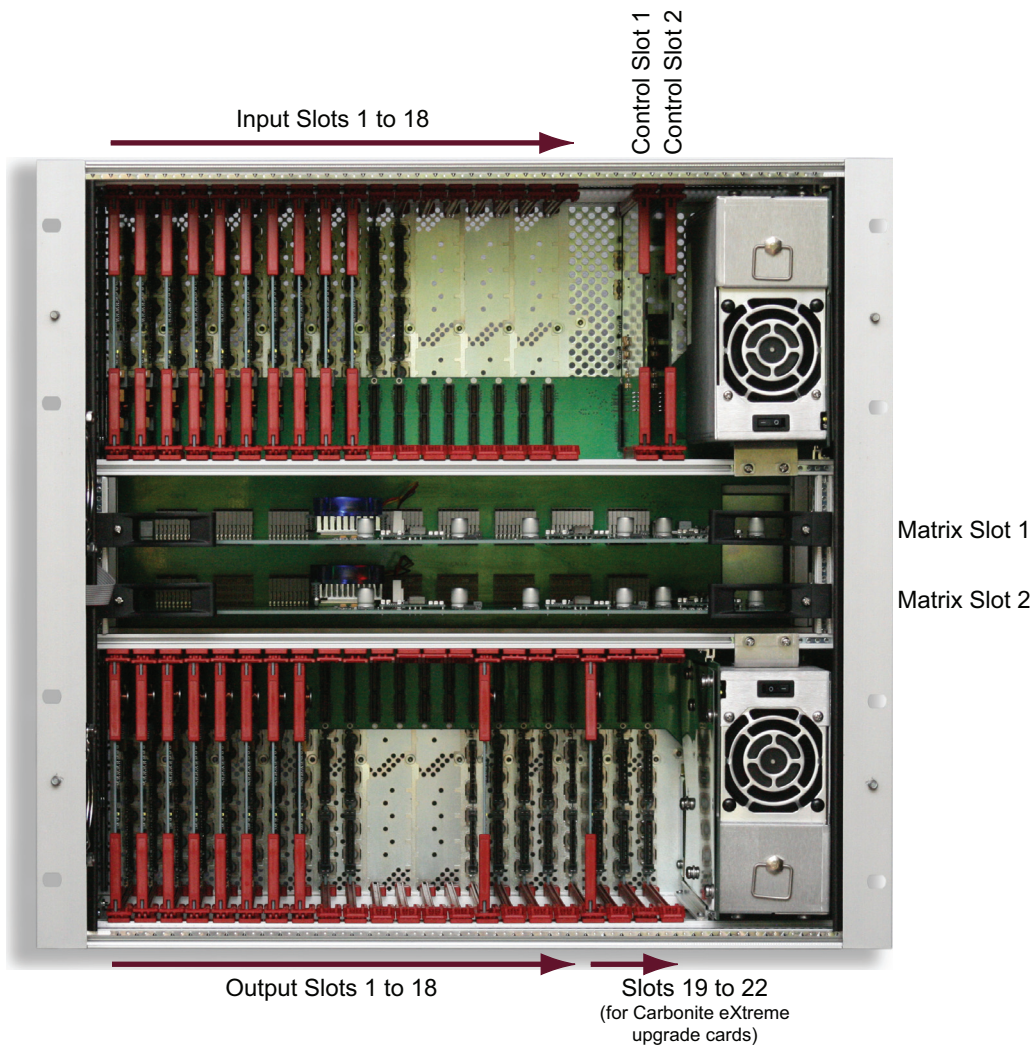4. Locate an available slot position in the frame.

Figure 4.7 Slot Positions in the Chassis

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5. Hold the card along the edge that has the LEDs.

6. Do one of the following:

    • For input, output, and control cards, orientate the card so that the component side is facing to the right when the card is held vertically.

    • For matrix cards, orientate the card so that the component side is facing up when the card is held horizontally.

7. Align the card carefully with the guide rails for the slot, then gently push the card into the slot, until the locking levers reach the front of the guide rails.

8. Swing the locking levers out from both ends of the card.

9. Seat the card with the motherboard and the rear connector by gently pushing the levers until they are flush with the card.

> ⚠ **Warning** — *Do not use excessive force to seat the card as damage may occur.*

10. Insert other cards, as required.

11. Close the front door.

12. Insert and tighten the front door screw to secure the front door of the NK-3G144 shut.

13. Set up input and output cards via DashBoard as required.

✱ Input and output cards may be inserted in any of the 18 corresponding slots.

✱ If the card is a direct replacement, the setting information is automatically transferred from the control card.

For More Information on...

• replacing a matrix or control card, see "**Replacing a Matrix or Control Card**" on page 56.

Connecting Source and Destination Devices

A routing switcher system requires careful planning. This can include allocating common connector numbers across several router levels or partitions within the routing switcher system to ensure that source and destination equipment switch on just one switch command. Alternatively, the inputs and outputs can be mapped across multiple levels using the NK-VRC Virtual Routing Core.

> **ESD Susceptibility** — *Anti-static precautions must be taken when fitting or removing all cables. Wear an earthed wrist strap if possible, or place both hands on the metal rack frame before handling the cables.*

To connect source and destination devices to the routing switcher

1. Connect a 75 Ω coaxial cable with BNC connectors between the source or destination device and the appropriate input or output connector on the rear panel of the NK-3G144.

2. Ensure that the bayonet connector is locked in place correctly.

✱ A Trompeter tool may be useful for connecting BNC connectors in a densely wired routing switcher.

Connecting a Video Reference to NK Series Routing Switchers

All NK Series video and audio routing switchers accept a video reference. If connected, this ensures that switching occurs in the vertical interval across all router levels, that is, a switching pulse that complies with RP168:

* line 6 for SD (PAL reference)
* line 10 for SD (NTSC reference)
* line 7 for HD (1080i)
* line 7 for HD (720p)
* line 7 for 3G

✱ The non-locked switching pulse is free-running.

To connect the video referencing signal

1. Connect a 75 Ω coaxial cable between the video reference signal output and one of the **VID REF** connectors (75 Ω BNC) on the rear panel of the routing switcher.

2. Do one of the following:

    * Connect the remaining **VID REF** connector on the rear panel of the routing switcher to a **VID REF** connector on the rear panel of another routing switcher using a 75 Ω coaxial cable.

    * Connect the remaining **VID REF** connector on the rear panel of the routing switcher to a 75 Ω BNC termination.

3. Continue looping the **VID REF** connectors across the routing switchers that you want to have switching simultaneously.

✱ The last routing switcher in the video referencing loop must have a 75 Ω BNC termination connected to its spare **VID REF** connector.

Installing DashBoard

DashBoard can be downloaded at http://www.rossvideo.com/dashboard.

DashBoard is used to configure and operate NK systems and individual NK Series devices.

For More Information on...

* DashBoard system requirements, please refer to the *DashBoard User Guide*.

Connecting to the NK-IPS in the Routing Switcher System

Before you can set up and send a configuration document to the routing switcher, you must connect an NK-IPS to the routing switcher. Once DashBoard locates the NK-IPS, the attached devices are visible and can have configuration documents sent to them.

By default, DashBoard attempts to auto-detect the NK-IPS on the network. If the device is not detected automatically, the NK-IPS can be manually added using the **New NK IPS Connection** window in DashBoard.

To connect to the NK-IPS

1. Open **DashBoard**.

2. In the **Basic Tree View**, locate the NK-IPS of the routing system to which the NK-3G144 has been connected.

3. Double-click the NK-IPS icon to expand the node.

    The connected devices are listed below the NK-IPS icon.

4. Ensure the NK-3G144 is listed in the devices connected to the selected NK-IPS.

For More Information on...

• detecting devices and querying devices, refer to the *NK-IPS User Guide*.

Checking the Firmware Version of a Device

The routing switcher must operate with other devices that have v2.00 firmware or later. Firmware may be updated easily using DashBoard.

Using DashBoard to check the firmware version

Contact Ross Video Technical Support for the latest firmware versions.

To check the firmware version of any device using DashBoard

1. Open **DashBoard** and connect to the NK-IPS (see "**Connecting to the NK-IPS in the Routing Switcher System**" on page 32).

2. In the **Basic Tree View** section, double-click the device for which you want to check the firmware version.

   The device tab for the selected device opens in DashBoard.

3. In the **Device Details** section of the device tab, view the **Version** field for the current firmware version.

Upgrading the Firmware Version of the NK-3G144

Firmware upgrade files can be obtained by contacting Ross Video Technical Support.

To upgrade the NK-3G144 software:

1. In **DashBoard**, click **Send Firmware**.

   The firmware file browser opens.

2. Select software file ips22x.tfi.

3. Click **Open**.

   The **Confirm Upload** dialog box opens.

4. Click **Continue**.

   A progress bar is displayed. When the upload has completed, a confirmation box opens.

5. Click **OK**.

Setting up a Routing Switcher

Implement your routing system plan and then use the NK-3G144 device tab in DashBoard to configure the NK-3G144. The parameters for a routing switcher can be saved to a configuration file.

✴ An NK-IPS network bridge must be connected to the system.

✴ Before setting up any parameters for the routing switcher, ensure that all NK Series devices in the routing switcher system have firmware v2.00 or later.

For More Information on...

• checking and upgrading firmware see "**Checking the Firmware Version of a Device**" on page 33 and "**Upgrading the Firmware Version of the NK-3G144**" on page 33.

• saving a configuration file, see "**Saving the Current File for the Routing Switcher**" on page 46.

Implementing Your System Plan

An effective routing switcher system takes careful planning. You may use multiple router levels across several input and output devices.

The following process for setting up the routing switcher is recommended:

```
┌─────────────────┐
│  Update device  │
│     details     │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│  Set up input and│
│  output cards   │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│  Set up input and│
│  output offsets │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│  Set up partitions│
└─────────────────┘
         │
         ▼
┌─────────────────┐
│  Set up video   │
│   referencing   │
└─────────────────┘
```
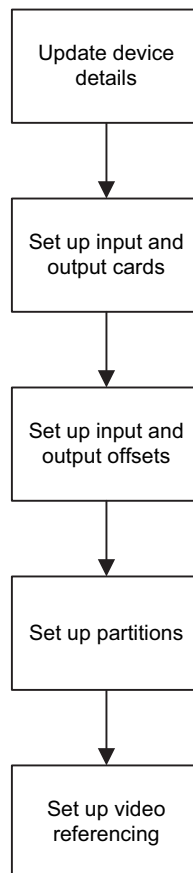
Figure 5.1 Process for setting up the NK-3G144

The NK-3G144 Device Tab

Use the device tab to configure the physical map, resources, parks, resource rules, and priorities for the NK-3G144 router.

To open the NK-3G144 device tab

1. Open **DashBoard**.

2. In the **Basic Tree View**, double-click the icon of the NK-IPS to which the NK-3G144 is connected.

    The connected devices are listed below the NK-IPS icon.

3. Double-click the icon of the NK-3G144.

    The device tab for the NK-3G144 opens.

Device Details

The **Device Details** section is located at the top of the device tab and lists the individual characteristics of the NK-3G144.

Table 5.1 Device Details

Item	Description
Serial Num (read-only)	The serial number of the device. This parameter is unique to the device and set during manufacturing.
Version (read-only)	The version status of the firmware detected in the device. If the firmware version for any connected NK Series device is earlier than v2.00, you must upgrade the firmware in that device (see "**Upgrading the Firmware Version of the NK-3G144**" on page 33).
Name	The name for the device. The default name for any routing switcher is its product number, for example, NK-3G144. This parameter can be changed to any name that uniquely identifies the device, for example, NK-3G144_1. The name is also displayed in **Basic Tree View**. This field has a maximum of 16 characters and is used for description and identification only.
Group	The group to which the device belongs. This parameter is used to identify items of equipment that may be in the same location or used for a similar purpose. For example, equipment in the same rack, or a logical grouping of modules that can be operated as a group. This field has a maximum of 10 characters and by default is blank.
Details	Assigned by the user to give a device specific details. For example, a physical location or a brief description of its use. This field has a maximum of 16 characters and is used for description and identification only.
Address	This address is used within the overall control system to identify devices. Each device must be given a unique T-Bus address to avoid hardware and communication conflicts. The valid value range for assigning an individual device T-Bus address is 1-255.

Default Configuration

Every NK Series device leaves manufacturing with a default configuration. This default configuration is viewed by opening the device tab for the device in DashBoard. If you have made changes to the configuration, but want to return to the default configuration, you can send the default file to the device (see "**Sending a Configuration File to a Device**" on page 47).

Router Levels

Each routing switcher is assigned a level, or number of levels if it has been partitioned. These level assignments can be changed through the device tab in DashBoard.

Table 5.2 Default Router Levels

Signal Format	Router Level
Multi-definition digital video (including 3G, HD, SD)	1
SD SDI video	2
AES/EBU digital audio 1	3
AES/EBU digital audio 2	4
Analogue video	5
Analogue audio (left)	6
Analogue audio (right)	7
Machine control	8

Input Cards

Each signal on an input card can have line equalization independently enabled or disabled. By default, line equalization is enabled across all connectors on an input card.

Output Cards

Each signal on an output card can have reclocking independently enabled or disabled. The output card can be set to automatically detect each signal, or it can be set for HD signals or SD signals to minimize detection time.

By default, reclocking and automatic signal detection are enabled across all connectors on an output card.

Input and Output Offsets

Input and output offsets may be assigned to meet the requirements of your routing switcher system. By default, the first input and first output for a routing switcher are each set to 1.

Partitions

Routing switchers can have up to eight partitions. By default, a routing switcher has one partition.

Setting Up Input Cards

The input card allows you to enable or disable cable equalization, depending on the cable length and signal data rate for signals that comply with SMPTE 259M, 292M, 344M, 424M and DVB-ASI. When enabled, the cable equalizing inputs of the NK-3G144 adjust to the data rate and cable length to minimize jitter.

To set up an input card

1. Open the NK-3G144 device tab (see "**The NK-3G144 Device Tab**" on page 36).

2. Select the **Card Details** tab.

3. On the simulated NK-3G144, select the input card that you want to set up.

    The current information for that card is displayed.

The detected temperature on this card is 27°C

Slot 1: 3G SDI Input Card

Signal Present: ① ② ③ ④ ⑤ ⑥ ⑦ ⑧

EQ Enabled: ☑ ☑ ☑ ☑ ☑ ☑ ☑ ☑

27°C
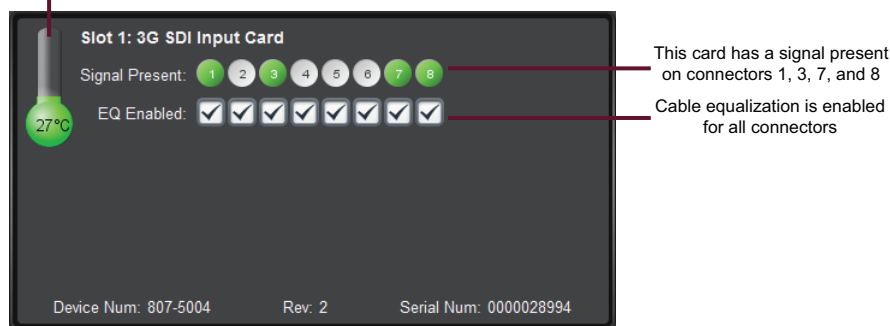
This card has a signal present on connectors 1, 3, 7, and 8

Cable equalization is enabled for all connectors

Device Num: 807-5004   Rev: 2   Serial Num: 0000028994

If a signal is present on any of the connectors associated with this input card, the numbered **Signal Present** circle corresponding to this connector is colored green. If a signal is not present, the numbered circle is gray.

4. Click on the **EQ Enabled** check box to enable cable equalization for the corresponding connector.

5. Set up any other input cards as required.

6. Send the current file to the device (see "**Sending a Configuration File to a Device**" on page 47).

★ If you click and drag across the squares, you can quickly enable or disable cable equalization.

Setting Up Output Cards
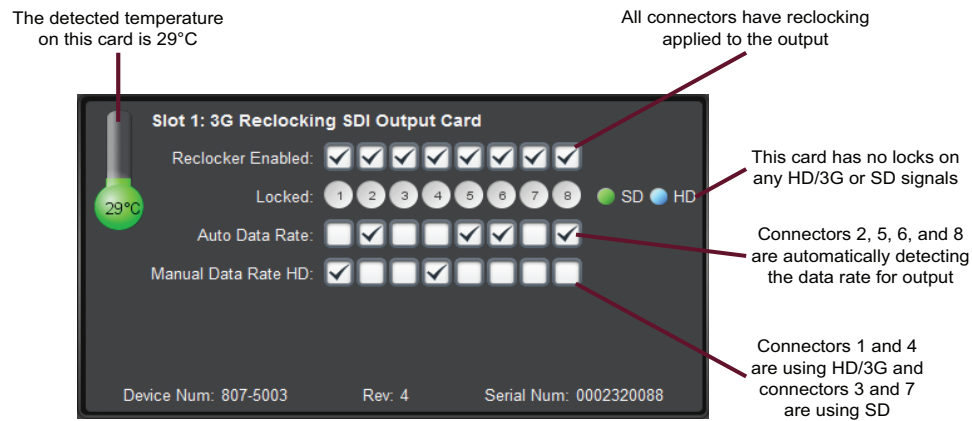
The output card allows you to specify the type of signal, and whether or not reclocking is applied to the output.

To set up an output card

1. Open the NK-3G144 device tab (see "**The NK-3G144 Device Tab**" on page 36).

2. Select the **Card Details** tab.

3. On the simulated NK-3G144, click on the output card that you want to set up.

   The current information for that card is shown.

If a signal is present and locked on any of the connectors associated with this output card, the numbered **Locked** circle corresponding to this connector is colored blue for HD/3G and green for SD. If a signal is not present, the numbered circle is gray.

4. If the signal that is passed to the output card has accumulated jitter that must be removed, select the numbered **Reclocker Enabled** check box for the corresponding output.

   In some situations, you may want to disable reclocking to reduce cumulative effects of serial reclocking along a signal path.

5. Use the information in **Table 5.3** to set up the output card for the data rate of the signal.

Table 5.3 Data Rate

	Description	HD Data Rate
Auto Data Rate	The selected output channel will automatically lock to all valid video streams. If **Auto Data Rate** is selected, then selecting **Manual Data Rate HD** has no effect for that channel.	Auto Data Rate: ☑ Manual Data Rate HD: ☐ or Auto Data Rate: ☑ Manual Data Rate HD: ☑
Manual Data Rate HD	The selected output channel will only lock to valid HD or 3G streams.	Auto Data Rate: ☐ Manual Data Rate HD: ☑
Manual Data Rate SD	The selected output channel will only lock to valid SD streams.	Auto Data Rate: ☐ Manual Data Rate HD: ☐

6. Set up any other output cards as required.

7.   Send the current file to the device (see "**Sending a Configuration File to a Device**" on page 47).

✦ If you click and drag across the squares, you can quickly enable or disable reclocking.

Setting Up Input and Output Offsets

If you are using several routing switchers across the same router level, you can offset the input and output ranges of each routing switcher so that each can be addressed as required. This is done by assigning the first input and first output for the routing switcher via DashBoard.

You can offset routing switchers:

• with independent inputs and outputs (see **Figure 5.2**)
• with overlapping inputs and outputs (see **Figure 5.3**)
• with common inputs and parallel outputs (see **Figure 5.4**)
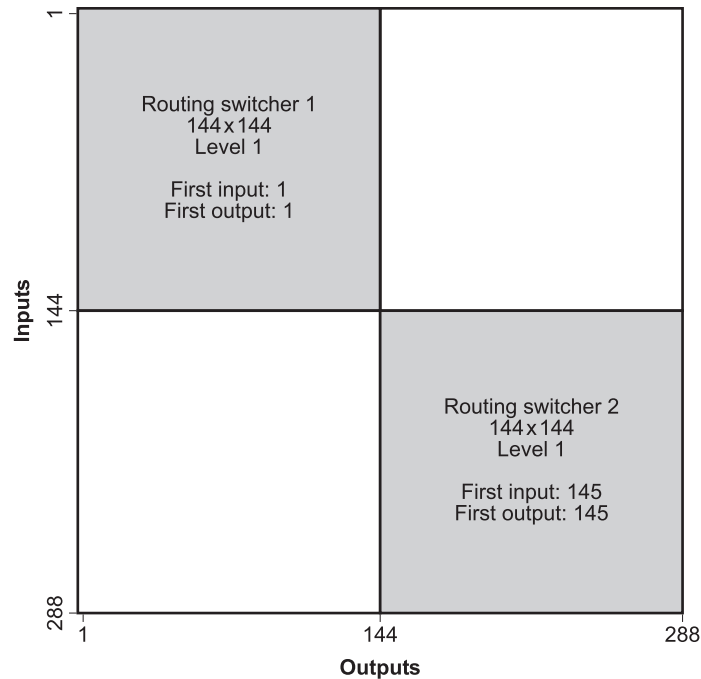
Figure 5.2 Offsetting two routing switchers for independent inputs and outputs
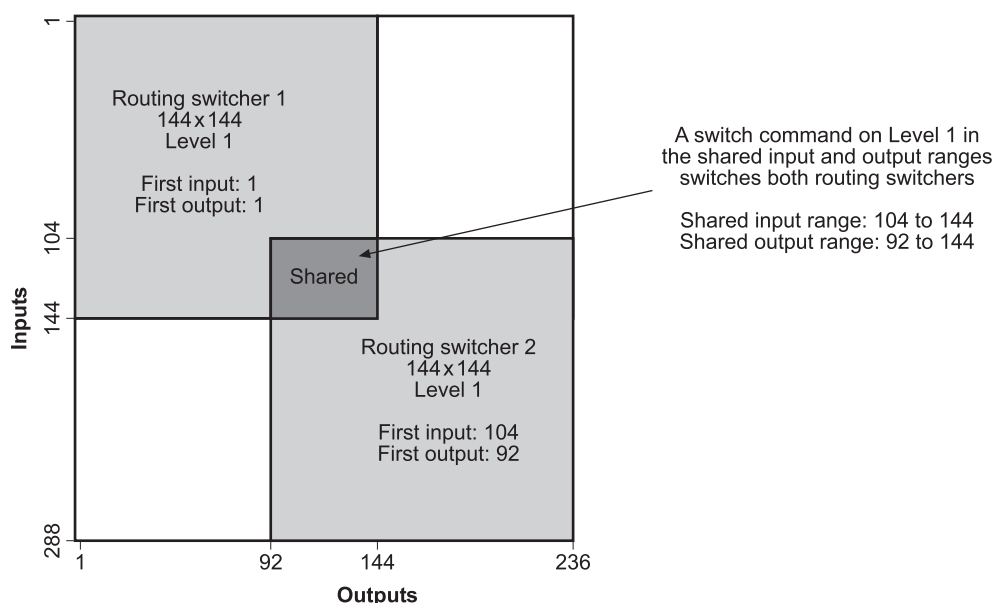
Figure 5.3 Offsetting two routing switchers for overlapping inputs and outputs
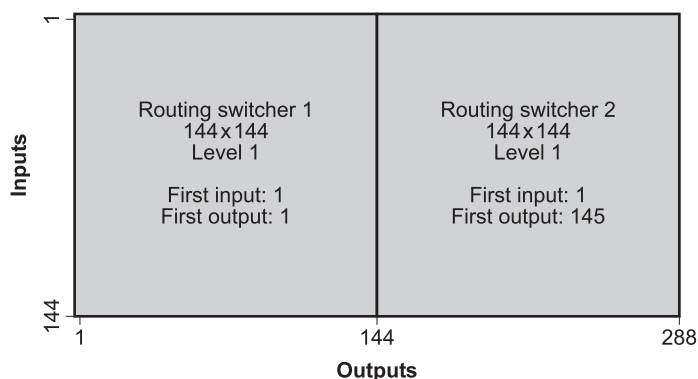
Figure 5.4 Offsetting two routing switchers for common inputs and parallel outputs

To set up offsets

1. Open the NK-3G144 device tab (see "**The NK-3G144 Device Tab**" on page 36).

2. Select the **Config** tab.

3. In the **First Input** box, enter or select the number that you want to define as the first input for the routing switcher.

4. In the **First Output** box, enter or select the number that you want to define as the first output for the routing switcher.

5. Send the current file to the device (see "**Sending a Configuration File to a Device**" on page 47).

Setting Up Partitions

The routing switcher can be partitioned to group certain inputs and outputs together. These may be for functional groups of users or to prevent certain input and outputs being switched (each partition only switches from inputs to outputs contained within the partition). A routing switcher may also be partitioned so that different router levels can be applied to each partition. Source and destination devices should be connected to the physical connectors on the routing switcher according to the relevant level of the partition.

A routing switcher can have up to eight partitions. The number of inputs/outputs per partition is calculated by dividing the matrix size of the routing switcher by the number of partitions. If this does not divide exactly, any remaining inputs and outputs cannot be used.

Table 5.4 Partition sizes for a 144×144 routing switcher

Number of Partitions	Input/Output Size	Leftover Inputs/Outputs (cannot be used)
1	144×144	0
2	72×72	0
3	48×48	0
4	36×36	0
5	28×28	4
6	24×24	0
7	20×20	4
8	18×18	0

For example, a 144×144 routing switcher may be partitioned as shown in **Figure 5.5**, **Figure 5.6**, or **Figure 5.7**.
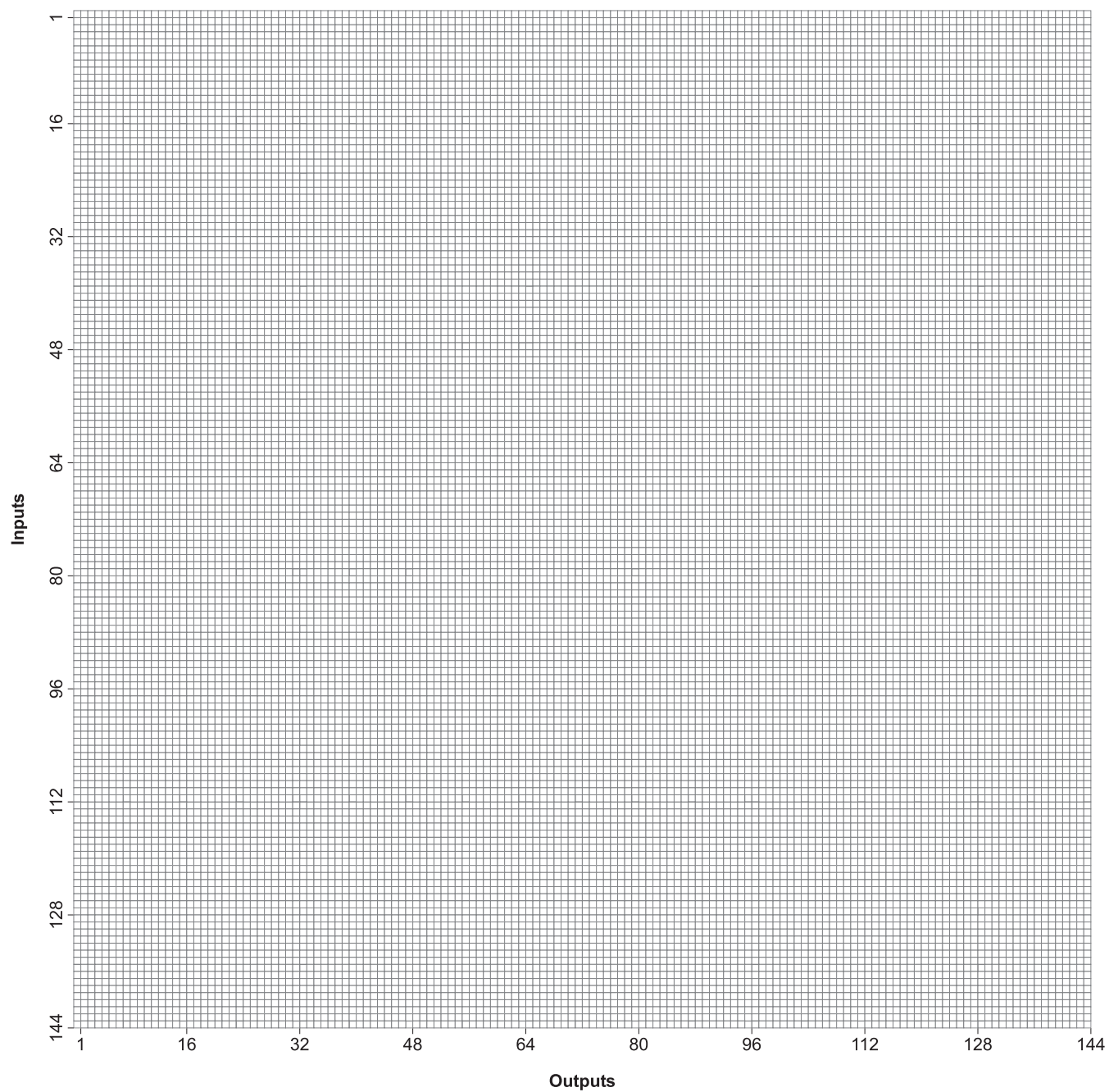
Figure 5.5 Example of a 144×144 routing switcher with one partition
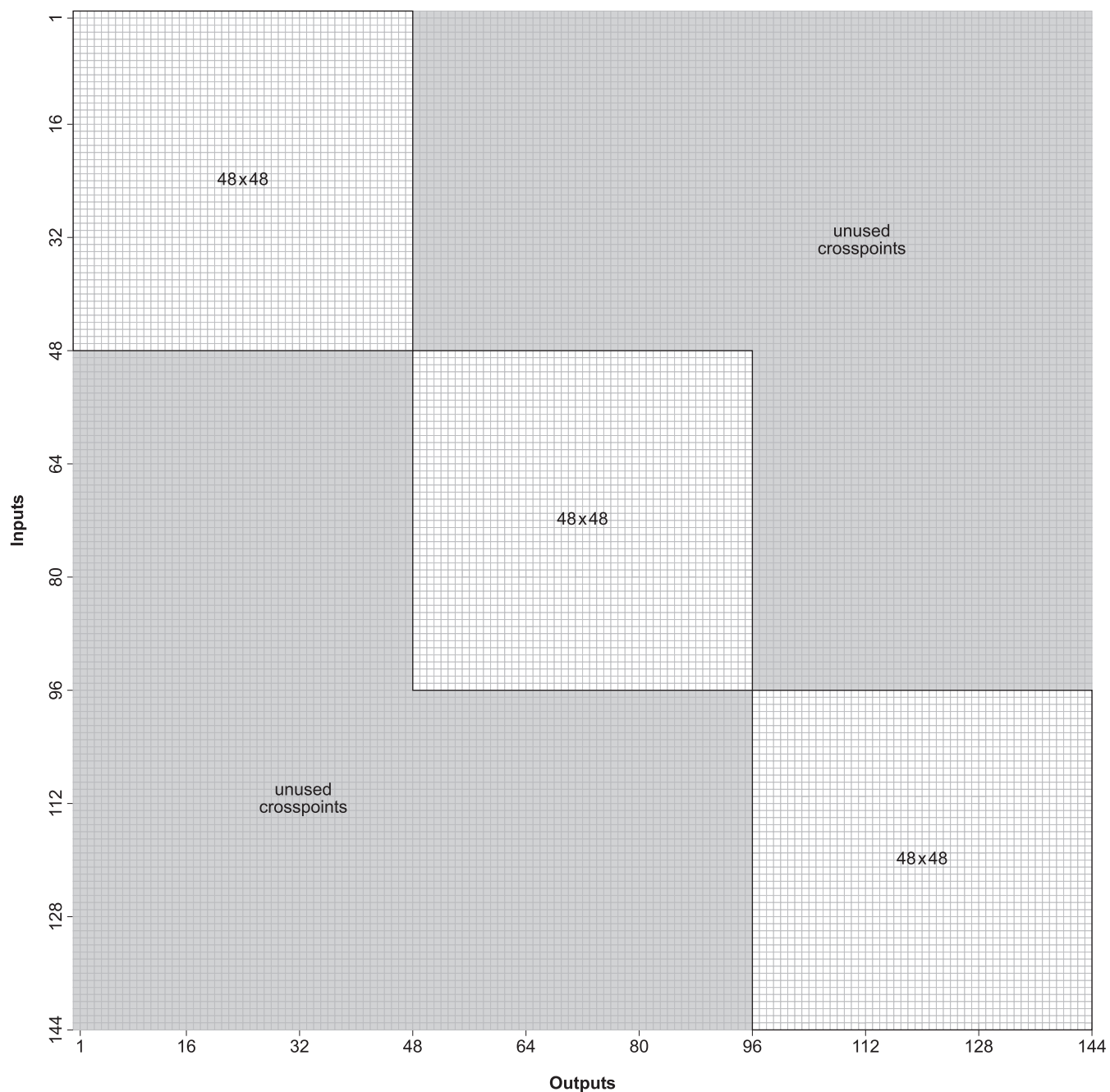
Figure 5.6 Example of a 144×144 routing switcher with three partitions
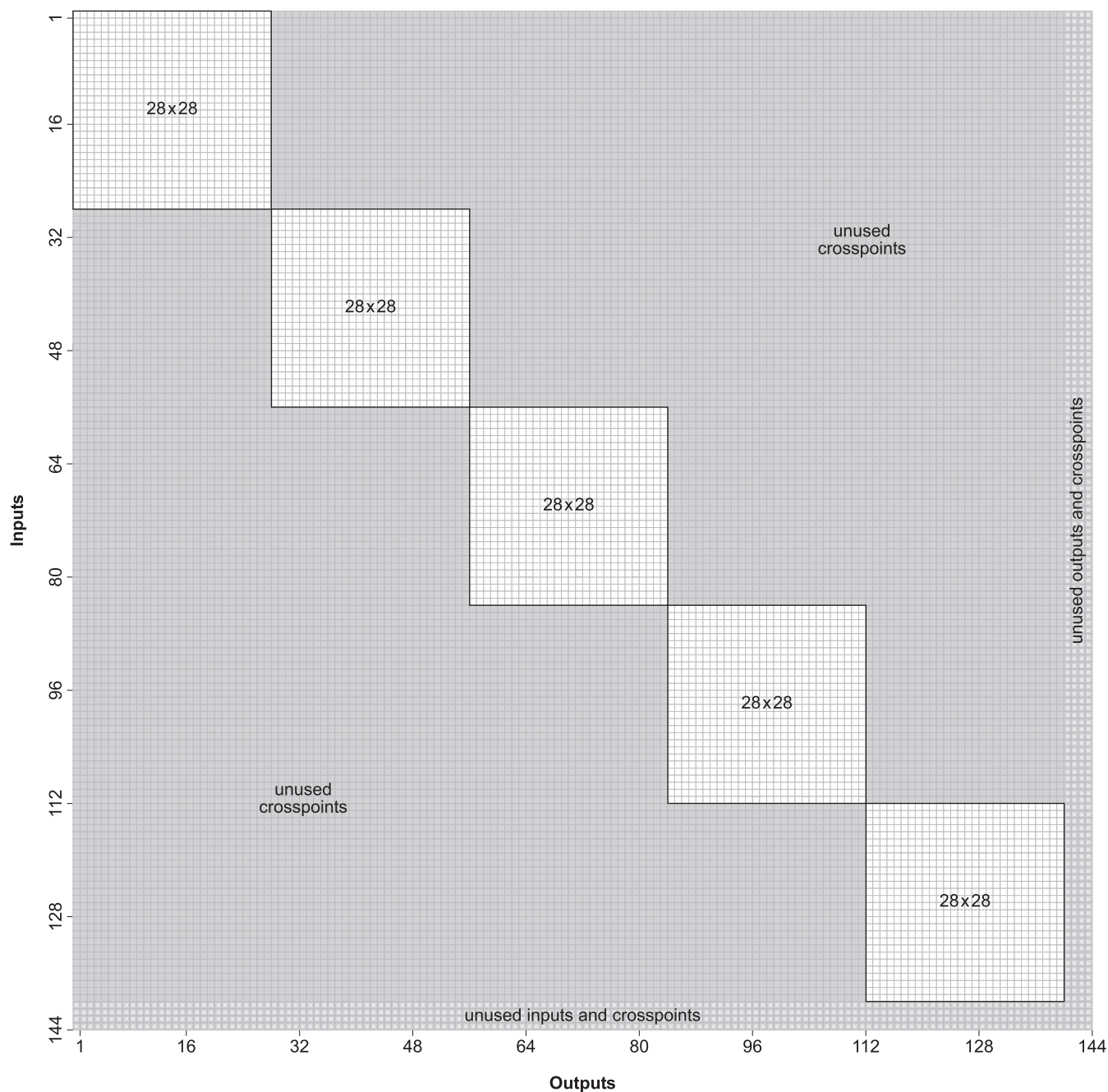
Figure 5.7 Example of a 144×144 routing switcher with five partitions

To set up partitions

1. Open the NK-3G144 device tab (see "**The NK-3G144 Device Tab**" on page 36).

2. Select the **Config** tab.

3. In the **Num Partitions** box, enter or select the number of partitions that you want to use.

4. In the **Partition Levels** table, select the router level that you want to use for each partition number.

   A selected router level is indicated by a solid blue box.

5. Send the current file to the device (see "**Sending a Configuration File to a Device**" on page 47).

★ If you click and drag across the level mask, you can quickly select or unselect router levels.

★ If you want all partitions to switch on the same router level, select the same box across all partitions.

Setting Up Video Referencing

If you have installed your routing switchers for video referencing (see "**Connecting a Video Reference to NK Series Routing Switchers**" on page 32), you need to set up the switching point to a predefined line for a particular format, or you can set up a custom switching line to match the timing requirements of your system.

To set up video referencing

1. Open the NK-3G144 device tab (see "**The NK-3G144 Device Tab**" on page 36).

2. Select the **Config** tab.

3. Use the information in **Table 5.5** to select the point on which you want the signal switching to occur:

Table 5.5 Reference

Switching Point	Description
SD	For 50.94/60fps references, switching delay is set to NTSC line 10. For 50fps references, switching delay is set to PAL line 6.
HD (1080i)	Switching delay is set to line 7 of a 1080i HD signal.
HD (720p)	Switching delay is set to line 7 of a 720p HD signal.
3G	Switching delay is set to line 7 of a 1080p 3G signal.
Custom	Used for any signal where the switching point lies outside the range of predefined SD and HD switching points. A variety of switching points across the routing switchers may be required to deal with the range of digital video formats that are available.

4. If you have selected a switching point of **Custom**, use the information in **Table 5.6** to set the custom switching point.

Table 5.6 Custom Switching

Custom Switching Point	Description
Custom Switching Line	The custom switching line sets the line number on which switching occurs.
Custom Switching Position	The custom switching position is the time in ms from the start of the custom switching line to the actual switching event.

5. Send the current file to the device (see "**Sending a Configuration File to a Device**" on page 47).

Saving the Current File for the Routing Switcher

The parameters that you have set up on the device tab for a routing switcher are stored in a configuration file. When you have finished making changes to the configuration of the routing switcher, you should save the file and then add the location of the file to the **File Navigator** so that you can conveniently access it later.

To save a new file

1. Select the device tab containing the file that you want to save.

2. Click ![save icon] to save the current file.

    The **Export to file** browser opens.

3. Navigate to the folder in which you want to save the configuration file.

    The default location is Desktop\My Documents.

4. Click **Save**.

To add the file location to the File Navigator

1. In the **File Navigator**, click ![plus icon] to add a directory.

    The **Browse for Folder** browser opens.

2. Navigate to the folder that contains the configuration file.

3. Select the folder.

4. Click **OK**.

    The folder and saved files can now be accessed via the **File Navigator**.

To save an existing file

1. Select the device tab containing the configuration file that you want to save.

2. Click ![save icon] to save the current file.

To open a saved file

1. In the **File Navigator**, navigate to the saved configuration file that you want to open.

2. Double-click on the icon for the file.

Sending a Configuration File to a Device

When you have made changes to the configuration of a device, the changes are not activated in the device until the file containing the changes is sent to the device. You can open a saved configuration file, make changes to it, save it, then send it to a device.

To send the current file to a device

1. Select the device tab containing the configuration file that you want to send to a device.

2. Configure the routing switcher.

    Save the configuration to a configuration file if necessary.

3. Click **Send Configuration**.

    The **Send Config to NK Device** dialog box opens.
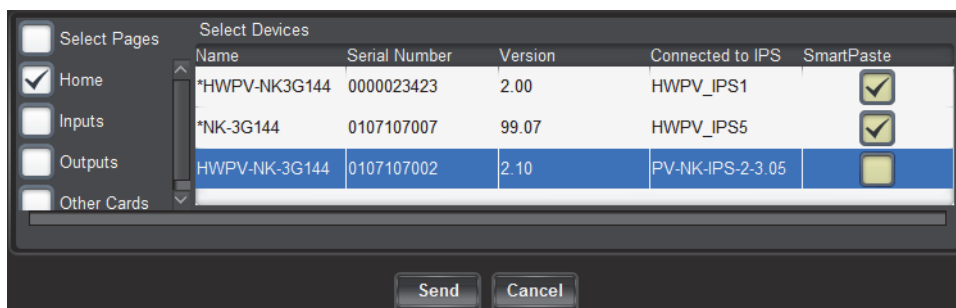
4. Select the device pages to send to the device. Use the information in **Table 5.7** as a guide.

   Any of the pages in the routing switcher device tab that contain information that has been changed are automatically selected for sending to the routing switcher.

Table 5.7 Page Descriptions

Page	Description
Select Pages	Select this check box to select all device pages.
Home	Select this check box to select the information contained in the **Config** tab.
Inputs	Select this check box to select the input cards contained in the **Card Details** tab.
Outputs	Select this check box to select the output cards contained in the **Card Details** tab.
Other Cards	Select this check box to select the cards, other than input and output cards, contained in the **Card Details** tab.

5. In the **Select Devices** list, select the device to which the current configuration is to be sent.

6. Click **Send**.

   DashBoard automatically reloads the device tab.

For More Information on...

• sending a configuration using SmartPaste, refer to "**SmartPaste**" on page 48.

SmartPaste

SmartPaste offers a convenient way to apply a configuration file or a device configuration to other NK-3G144 devices. Selecting the **SmartPaste** check box of a device will send the configuration to that device.

★ SmartPaste can only be used to apply a configuration to another of the same device.

To SmartPaste a configuration

1. Open a device tab or configuration file.

2. Click **Send Configuration**.

   The **Send Config to NK Device** window opens.

3. Select the device pages to send to the device (see step 4 in "**Sending a Configuration File to a Device**" on page 47 for the device page descriptions).

4. In the **Select Devices** list, select the **SmartPaste** check box of the device(s) to which the configuration will be sent.

   Selecting **SmartPaste** will send the **Device Details** as well as the selected device pages.

5. Click **Send**.

   DashBoard automatically updates the device tab of the device(s) with the configuration.

★ SmartPaste can also be used by dragging a configuration file from the **File Navigator** to the **Device Details** area of a device, however, the configuration is pasted but not actually sent to the device.

   This method pastes only device pages and not the **Device Details** and can only be dragged and dropped into one device at a time.

Operating a Routing Switcher

A routing switcher responds to switch commands from NK Series control devices. These commands contain source, destination, and level designations. Routing switchers respond to the control device with its new crosspoint switch status.

NK Series control devices include remote control panels, DashBoard NK Switchboard, the virtual control panel (NK-VCP), NK-GPI, NK-SCP/A and NK-SCP/K2.

For More Information on...

* NK Series control devices, see the documentation provided with the control device.

LED Indicators

LED indicators are used to check the current operating status of a routing switcher. The primary Heartbeat LED indicator is situated on the front panel of a router in the name badge. The NK-3G144 has additional LEDs on power supplies and all of the cards. Details of the status of each LED are provided below.

Heartbeat LED

The front panel of the NK-3G144 has a Heartbeat LED. Following power-up, this LED flickers while the NK-3G144 is initializing.

During normal operation, the LEDs indicate the flow of requests and responses between the remote control panel and the routing switcher.

Table 6.1 Indicators for the Heartbeat LED

Color	Status	Function
Green	Flicker	The routing switcher has performed a valid switch or protect request.
White	Pulse every 5 s	The CPU is running.
Blue	Flicker	The routing switcher has received a message.
Red	Flicker	The routing switcher has not performed the switch or protect requested because it has been blocked by a protect or there is an error.
	Pulse every 2.5 s	An alarm condition is current.
Green, white, blue or red	Solid	The CPU is not operating correctly.

Input Card LEDs

Table 6.2 Indicators for the Input Card LEDs

LED	Status	Function
PWR	Green, solid	3.3 V is present on the input card.
FUSE	Red, solid	An overcurrent condition on the 15 V supply is present.
TEMP	Red, solid	The temperature of the input card is above 80°C.

Output Card LEDs

Table 6.3 Indicators for the Output Card LEDs

LED	Status	Function
PWR	Green, solid	3.3 V is present on the output card.
FUSE	Red, solid	An overcurrent condition on the 15 V supply is present.
TEMP	Red, solid	The temperature of the output card is above 80°C.

Control Card LEDs

Table 6.4 Indicators for the Control Card LEDs

LED	Status	Function
REF	Green, solid	An external reference signal has been detected.
LOCK	Green, solid	The external reference signal is a valid PAL/NTSC signal, and the clock generator has locked to the signal.
PWR	Green, solid	The onboard switch mode power supply is providing 5 V.
FUSE	Red, solid	An overcurrent condition on the 15 V DC supply to the control card is present.
STAT	Backup CPU card flashes green when communicating with active CPU.	The active card mirrors the front panel Heartbeat LED.

Matrix Card LEDs

Table 6.5 Indicators for the Matrix Card LEDs

LED	Status	Function
TEMP	Red, solid	The temperature of the matrix card is above 80°C.
FUSE	Red, solid	An overcurrent condition on the 15 V supply is present.
REG	Red, solid	At least one of the power regulators on the matrix card is no longer providing fixed and regulated DC voltages from the PSU, or PSUs, to the matrix card.
PRI	Red, solid	Indicates that the matrix board is currently the active (primary) matrix board in the frame.
PWR	Red, solid	The supply is ±5% outside of its nominal value.

PSU LED

Table 6.6 Indicators for the PSU LED

Status	Function
Green, solid	The PSU is producing 15 V output and there are no fault conditions current for the PSU.
Red, solid	14.6 V is present on the motherboard (from a second PSU), but there is no output from this PSU, or a fault condition exists for the PSU. Fault conditions for a PSU include: • high temperature • fan is not operating • output voltage is off • current drawn from PSU is > 40 A

✦ If a fault condition occurs on the PSU, the mains supply to the PSU needs to be switched off and then on again to re-establish the 15 V output from the PSU.

Monitoring the NK-3G144 via DashBoard

The status of the NK-3G144 can be monitored via DashBoard.

Monitoring the Overall Status

You can monitor the overall status on the **Config** tab.

To monitor the overall status of the NK-3G144 via DashBoard

1. Open the routing switcher device tab (see "**The NK-3G144 Device Tab**" on page 36).

2. Select the **Config** tab.

3. In the **Config** tab, scroll down the **Status**, **Frame Details**, and **Alarms** areas.

Status Area

The **Status** area displays the following:

Table 6.7 Status Descriptions

Item	Description
Reference Signal Type (read-only)	Local: the routing switcher is generating a free-running switching pulse every 40 ms. Reference Present (Tri-Level HD sync/PAL/NTSC): the routing switcher has detected an external video reference signal.
Chassis Fan Speed (read-only)	Displays the speed of the chassis fans in RPMs. The table represents the fans as they are viewed with the door of the routing switcher open.
Chassis Fan Errors (read-only)	The number shown for each fan is the total of the following conditions: 0: no errors 1: startup speed warning 2: startup speed failure 4: running speed warning 8: running speed failure 16: stopped (failure) The table represents the fans as they are viewed with the door of the routing switcher open.
Matrix Fan Speed (read-only)	Displays the speed of the matrix card fans in RPMs.
Fan Target (read-only)	Displays the target speed to which the front fans are currently set (**Slow**, **Med** (medium), **Fast**, or **Full**).
V Pulse Internal Error (read-only)	If the check box is showing as selected, this indicates that there is an error with the generation of the switching pulse. If this check box is showing as selected and crosspoint switches are not occurring, please contact Ross Video Technical Support.

Frame Details Area

The **Frame Details** area displays the device type numbers loaded from the frame EEPROM. The following details are displayed:

Table 6.8 Frame Details

Item	Description
Family Number (read-only)	Combined **Family** and **Device** numbers:
Device Number (read-only)	• 9807-5144 = NK-3G144 • 2500-200 = NK-3G144 • 2500-201 = NK-3G144/NK-3G144-X, Carbonite eXtreme
Frame Hardware Revision (read-only)	The build revision of the frame hardware.
Fan HB Hardware Revision (read-only)	The build revision of the front fan controller board.

Alarms Area

The **Alarms** area displays the following:

Table 6.9 Alarm Descriptions

Item	Color	Description
Reference (read-only)	Green	Reference Present: a video reference signal is detected. The type of signal detected is indicated in the **Status** section by the **Reference Signal Type** (PAL or NTSC).
	Yellow	No Reference Detected: a video reference signal is not present, so the routing switcher generates a random switching pulse every 40 ms. The **Reference Signal Type** in the **Status** section is Local.
Matrix (read-only)	Green	Matrix OK: the power to and from the matrix is within acceptable limits. The fuse is intact.
	Red	Matrix Error: the power to and from the matrix is outside of acceptable limits or the fuse has blown.
RCP Power (read-only)	Green	RCP Power OK: the phantom power supply provided via the **T-BUS** connector to NK Series devices is okay.
	Red	RCP Power Error: an overcurrent condition in the supply to the **T-BUS** connector has been detected.
I/O (read-only)	Green	I/O OK: all indicators on the input and output boards are okay.
	Red	I/O Error: at least one LED indicator on one of the input or output boards has a fault condition.
Fan Heartbeat (read-only)	Green	Fan Heartbeat OK: the speed of the fans is appropriate for the detected temperature of the cards. The fuse is intact.
	Red	Fan Heartbeat Error: at least one fan has a fault condition or the fuse has blown.
PSU 1 (read-only)	Green	PSU 1 OK: PSU 1 is operating correctly.
	Red	PSU 1 Error: PSU 1 has a fan fault, an internal fault, or the PSU has been removed.
PSU 2 (optional) (read-only)	Green	PSU 2 OK: PSU 2 is operating correctly.
	Red	PSU 2 Error: PSU 2 has a fan fault, an internal fault, or the PSU has been removed.

Monitoring a Card Status

You can monitor the status of the cards on the **Card Details** tab.

To monitor the status of the cards via DashBoard

1. Open the routing switcher device tab (see "**The NK-3G144 Device Tab**" on page 36).

2. Select the **Card Details** tab.

   The input and output cards show which signals are present.

3. On the simulated NK-3G144, click the card for which you want to view the details.

★ If a fuse has opened on a card, or the regulators have failed, the card will not be displayed on the **Card Details** tab.

Disabling the Alarm for a PSU

If you need to remove a PSU from the NK-3G144, you can disable the alarm for the PSU.

To disable the alarm for a PSU that has been removed from the frame

1. Open the routing switcher device tab (see "**The NK-3G144 Device Tab**" on page 36).

2. Select the **Card Details** tab.

3. On the simulated NK-3G144, click on the PSU that you have removed or switched off.

4. Clear the **Alarm/PSU Detection Enabled** check box.

5. Send the current file to the device (see "**Sending a Configuration File to a Device**" on page 47).

Resetting the NK-3G144

When you perform a reset, the NK-3G144 loads the last known operating state and configuration file that is stored in memory.

To reset the device

• In **DashBoard**, click the **Reboot** button located at the bottom of the device page.

Loading Default Settings

If you want to load the default settings of the device, the default configuration file needs to be sent to the device.

To load the default settings

• In **DashBoard**, send the default configuration file to the NK-3G144 (see "**Sending a Configuration File to a Device**" on page 47).

★ If the NK-3G144 fails to accept any files that are sent to it, you should reset the device.

Maintenance

This chapter covers the maintenance of NK-3G144. Refer to this chapter to replace a power supply unit, replace a matrix or control card, and to replace and clean the fan filters.

✶ Any maintenance performed inside the chassis should be restricted to service personnel only.

⚠️ **Caution** — *When the frame is energized, Hazardous Energy Levels are present on the chassis midplane where I/O card resettable fuses make contact with the 15V DC supply bus. Hazardous Energy Sources can cause fire or serious burns under short circuit conditions. Access to the inside chassis areas should be restricted to service personnel only, by use of the chassis door screw provided. The screw should be engaged to limit access to the inside chassis without a tool.*

Servicing within the chassis while energized should be limited to module card or supply installation, or defect replacement. Installation of the cards should be carried at the front of the enclosure and care should be taken to avoid any card or user contact with the resettable fuses on the chassis's midplane.

All other service or repair should be carried out off-line with the chassis in a de-energized state.

Replacing a PSU in the NK-3G144

⚠️ **ESD Susceptibility** — *Anti-static precautions must be taken when fitting or removing a PSU.*

To replace a PSU in the NK-3G144

1. Unscrew the screw on the front door of the NK-3G144 (see **Figure 7.1**).

Figure 7.1 NK-3G144 — Location of Front Door Screw

2. Open the front door.

3. Switch off the PSU using the switch on the front of the PSU.

4. Unscrew the two captive screws in the PSU from the frame.

5. Gently but firmly pull the PSU PCB out of the hole where it connects with the motherboard at the back of the frame.

6. Install the replacement PSU (see "**Installing a PSU into the NK-3G144**" on page 24).

7. Close the front door.

8. Insert and tighten the front door screw to secure the front door of the NK-3G144 shut.

Replacing a Matrix or Control Card

You may need to replace a matrix or control card during scheduled maintenance. Before removing a matrix or control card, you should ensure that the card is not the primary card.

To replace a matrix or control card

1. Open the routing switcher editor (see "**The NK-3G144 Device Tab**" on page 36).

2. Select the **Card Details** tab.

3. On the simulated NK-3G144, click on the matrix or control card that you want to remove.
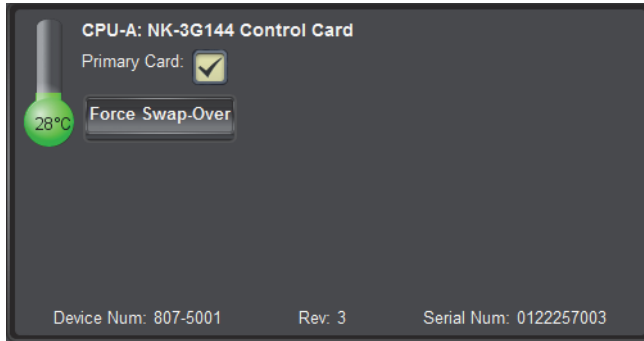
If the matrix or control card is the primary card, the **Primary Card** check box is selected.

If the **Primary Card** check box is not selected, you can remove the card.

4. If the card that you want to replace is the primary card, click **Force Swap-Over**.

5. Send the current file to the device (see "**Sending a Configuration File to a Device**" on page 47).

6. Unscrew the screw on the front door of the NK-3G144 (see **Figure 7.2**).

Figure 7.2 Front door screw of the NK-3G144

7. Open the front door.

8. Remove the card.

9. Insert the new card (see "**Inserting a Card into the NK-3G144**" on page 29).

10. Close the front door.

11. Insert and tighten the front door screw to secure the front door of the NK-3G144 shut.

Replacing and Cleaning the Fan Filter

The fan filter can be replaced or cleaned without opening the door on the NK-3G144.

✱ In order to prevent blockage, replacing and cleaning the fan filter for the NK-3G144 should be performed on a regular basis.

To replace or clean the fan filter

1. Remove the six screws that hold the 'skin' to the door.

2. Replace or clean the fan filter.

3. Put the skin back in place.

4. Reinsert the six screws to reattach the 'skin' to the front door.

NK-3G144 Inputs and Outputs

The top section of the rear of the NK-3G144 provides the inputs and the lower section provides the outputs. The I/O layout is as follows:
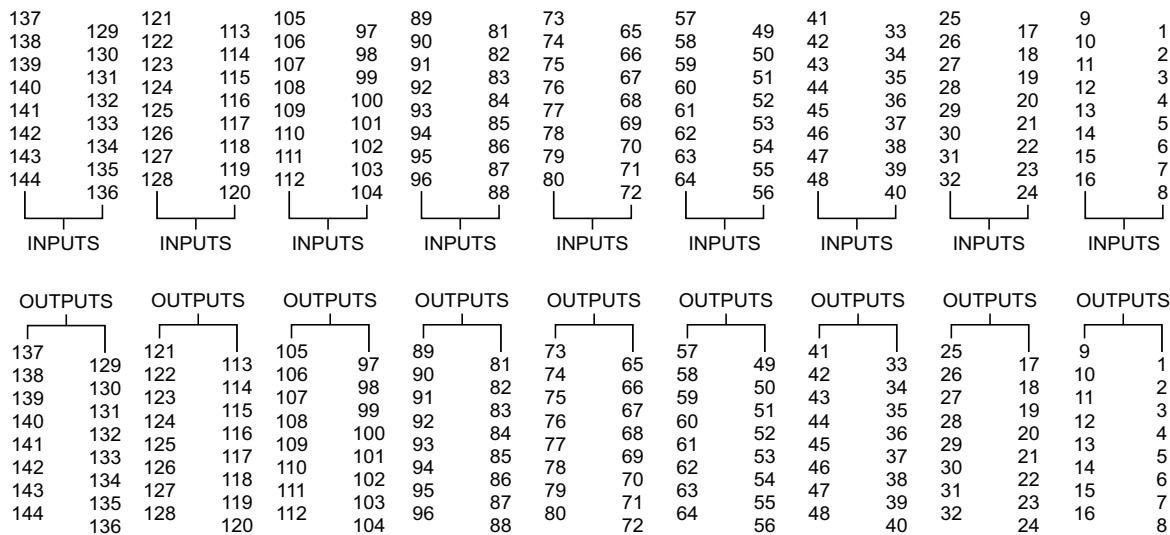
137		121		105		89		73		57		41		25		9	
138	129	122	113	106	97	90	81	74	65	58	49	42	33	26	17	10	1
139	130	123	114	107	98	91	82	75	66	59	50	43	34	27	18	11	2
140	131	124	115	108	99	92	83	76	67	60	51	44	35	28	19	12	3
141	132	125	116	109	100	93	84	77	68	61	52	45	36	29	20	13	4
142	133	126	117	110	101	94	85	78	69	62	53	46	37	30	21	14	5
143	134	127	118	111	102	95	86	79	70	63	54	47	38	31	22	15	6
144	135	128	119	112	103	96	87	80	71	64	55	48	39	32	23	16	7
	136		120		104		88		72		56		40		24		8

INPUTS   INPUTS   INPUTS   INPUTS   INPUTS   INPUTS   INPUTS   INPUTS   INPUTS

OUTPUTS   OUTPUTS   OUTPUTS   OUTPUTS   OUTPUTS   OUTPUTS   OUTPUTS   OUTPUTS   OUTPUTS

137		121		105		89		73		57		41		25		9	
138	129	122	113	106	97	90	81	74	65	58	49	42	33	26	17	10	1
139	130	123	114	107	98	91	82	75	66	59	50	43	34	27	18	11	2
140	131	124	115	108	99	92	83	76	67	60	51	44	35	28	19	12	3
141	132	125	116	109	100	93	84	77	68	61	52	45	36	29	20	13	4
142	133	126	117	110	101	94	85	78	69	62	53	46	37	30	21	14	5
143	134	127	118	111	102	95	86	79	70	63	54	47	38	31	22	15	6
144	135	128	119	112	103	96	87	80	71	64	55	48	39	32	23	16	7
	136		120		104		88		72		56		40		24		8

Figure 8.1 The NK-3G144 Input and Output Layout

Connectors

T-BUS Connector
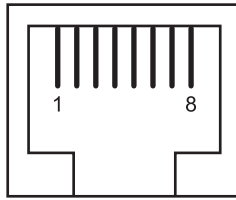
Figure 9.1 External view of T-BUS connector (RJ-45 female)

Table 9.1 Pinouts for the T-BUS Connector

Pin	Function
1	Ground
2	Ground
3	Tx/Rx RS485+
4	
5	
6	Tx/Rx RS485–
7	+14.4 V RCP
8	Phantom power

Alarm GPI Connector
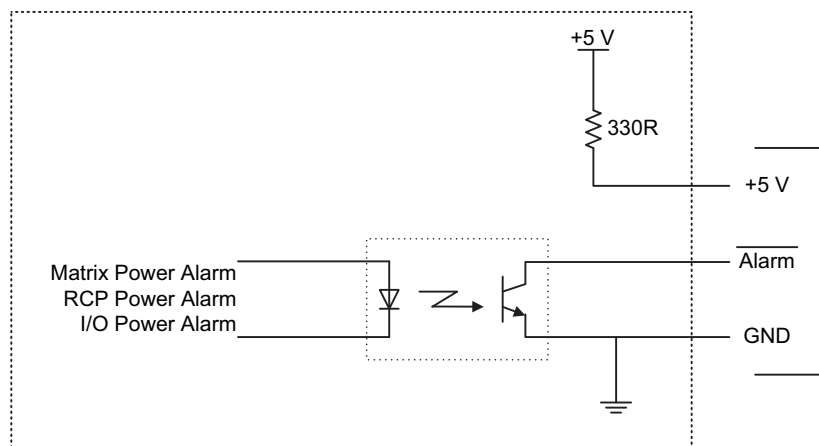
Figure 9.2 Alarm GPI connector

$\overline{\text{Alarm}}$

$\otimes$ ↑ 50 mA max

+

External
Power
Supply

−

GND
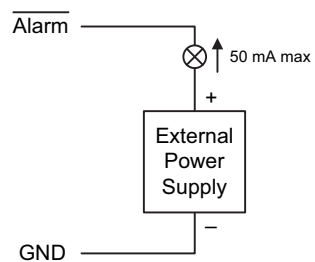
Figure 9.3 Alarm GPI connector with tally lamp

$\overline{\text{Alarm}}$

50 mA max ↑

+

External
Power
Supply

−

GND
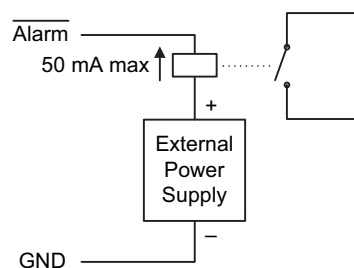
Figure 9.4 Alarm GPI connector with alarm relay

+5 V

15 mA max ↓

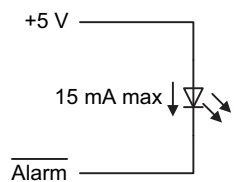$\overline{\text{Alarm}}$

Figure 9.5 Alarm GPI connector with OEM opto input

Technical Specifications

Inputs

Table 10.1 Technical Specifications — Inputs

Item	Specifications
Connection	75Ω BNC
Total number of inputs	Up to 144 in groups of 8
Return loss	> 15dB, 5MHz to 1.5GHz > 10dB, 1.5GHz to 3.0GHz
Level	800mV p–p, ±10%
Cable equalization	Up to 100m Belden 1694A or equivalent at 3.0Gbps
Jitter	< 0.2UI for SD and HD signals 0.3UI for 3G signals

Outputs

Table 10.2 Technical Specifications — Outputs

Item	Specifications
Connection	75Ω BNC
Total number of outputs	Up to 144 in groups of 8
Return loss	> 15dB, 5MHz to 1.5GHz > 10dB, 1.5GHz to 3.0GHz
Level	800mV p–p, ±10%
Re-clocking	Automatic at SMPTE 424M, 292M, 259M data rates Individually bypassable
Slew rate	Automatic at SMPTE 424M, 292M, 259M data rates Programmable via DashBoard
Jitter	< 0.2UI for SD and HD signals 0.3UI for 3G signals

General

Table 10.3 Technical Specifications — General

Item	Specifications
Standards	SMPTE 424M, 344M, 259M, 292M, DVB-ASI
Partitioning	Up to 8 partitions with independent level assignment
Configuration	DashBoard via NK-IPS
Dimensions	10RU × 320mm, 19" rack

Fan Speed

Table 10.4 Technical Specifications — Fan Speed

Item	Specifications
Slow	750rpm (minimum)
Medium	1500rpm
Fast	2500rpm
Full	3000rpm
Operation	Fan starts at full speed for 5s when routing switcher is powered up, then changes speed to suit the detected card temperature

Power

Table 10.5 Technical Specifications — Power

Item	Specifications
Power consumption	< 500W
Power supply	+15VDC, 32A, load sharing when two PSUs present
Input	100VAC to 240VAC, 50Hz to 60Hz, 8.2A to 4.1A
Output	14.6V, 34A, 500W maximum
Fuse	10A, slow blow

Environment

Table 10.6 Technical Specifications — Environment

Item	Specifications
Operating Temperature	0°C to 30°C (32°F to 86°F)